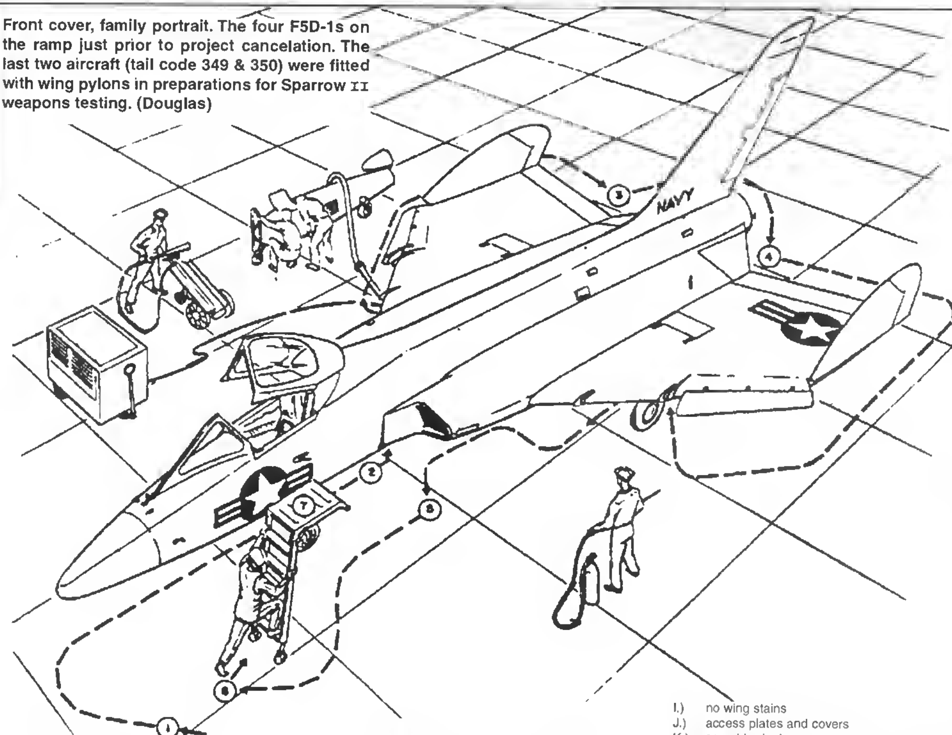
NAVAL FIGHTERS NUMBER THIRTY-FIVE

DOUGLAS F5D-1 SKYLANCER

BY STEVE GINTER

F5D-1 EXTERIOR INSPECTION

Front cover, family portrait. The four F5D-1s on the ramp just prior to project cancelation. The last two aircraft (tail code 349 & 350) were fitted with wing pylons in preparations for Sparrow II weapons testing. (Douglas)



1-2. FUSELAGE
- A.) static pressure vent (left side)
- B.) radome
- C.) static pressure venl (right)
- D.) air conditioning intake and exhaust ducts (right side)
- E.) nose wheel tire
- F.) nose wheel strut
- G.) nose wheel downlock pin removed
- H.) nose wheel well doors
- I.) nose wheel compartment vent exit
- J.) equip. compartment access hatch closed
- K.) emer. canopy jettison handle access door

2-3. R-H INTAKE, WING and LANDING GEAR
- A.) fuel tanks comp. venl air intake
- B.) engine air intake plug
- C.) intake duct
- D.) generator cooling air intake
- E.) rocket doors cyl. pressure gages
- F.) gen. air turbine drive air exit
- G.) generator cooling air exit
- H.) external power switch
- I.) external electric power
- J.) forward wing tank water drain cock
- K.) Aft wing tank water drain cock
- L.) transfer pump air turbine exhaust
- M.) forward engine access door closed
- N.) ext. engine starter unit hose & elec. plug
- O.) main wheel door
- P.) main wheel tire
- O.) main wheel strut
- R.) main wheel downlock pin
- S.) utility hyd. system elevon accum. gage
- T.) elevon hyd. system accum. gage
- U.) speed brake (lower)
- V.) access plates and covers
- W.) bottom ol wing (no stains)
- X.) general wing condition
- Y.) Slal
- Z.) navigation lights
- AA.) wing tip
- AB.) elevons
- AC.) fuel system vent exit
- AD.) speed brake
- AE.) forward and aft wing tank filler caps

3-4. TAIL SECTION
- A.) arresting hook pressure gage
- B.) tail bumper pressure gage
- C.) tail bumper and arresting hook
- D.) spin chute
- E.) tailpipe plug
- F.) tail pipe
- G.) fin and rudder
- H.) access plates and covers

4-5 L/H INTAKE DUCT, WING, LANDING GEAR, AND ARMAMENT BAY
- A.) access plales and covers
- B.) forward and aft wing tank filler caps
- C.) speed brake (upper)
- D.) elevons
- E.) wing tip
- F.) navigation lights
- G.) slats
- H.) general condition
- I.) no wing stains
- J.) access plates and covers
- K.) speed brake lower
- L.) util. hydraulic system elevon accum. gage
- M.) elevon hyd. system accumulator gage
- N.) main wheel door
- O.) main wheel tire
- P.) main wheel strul
- O.) main wheel downlock removed
- R.) pressure fueling switch panel
- S.) transfer pump air turbine exhaust
- T.) aft wing tank water drain cock
- U.) forward wing tank water drain cock
- V.) emergency generator door
- W.) fuselage fuel tanks comp. vent air exit
- X.) fire extinguisher discharge indicators
- Y.) drop-out hydraulic pump door
- Z.) engine air intake plug
- AA.) intake duct
- AB.) fus. fuel tanks comp. vent air intake
- AC.) forward aux. and aft fus. sump tanks water drain cocks
- AD.) aft fus. sump tank shut-off valve
- AE.) forward aux. and aft fus. sump tanks fuel filler caps

5-6. FUSELAGE
- A.) emer. canopy jettison handle access door
- B.) air conditioning intake and exhaust ducts
- C.) pitot pressure lube cover
- D.) access ladder
- E.) 100-pound CO_2 fire extinguisher
- F.) area clear 100 ft to the rear, 10 ft forward, 5 ft to the sides of the engine

7. COCKPIT AREA

THE DOUGLAS F5D-1 SKYLANCER

The sleek bat-like lines, tightly pinched cockpit enclosure and tall vertical fin shown here are the signatures of the F5D-1 Skylancer.

INTRODUCTION

Anyone having photos or other information on this or any other naval or marine aircraft, may submit them for possible inclusion in future issues. Any material submitted will become the property of NAVAL FIGHTERS unless prior arrangement is made. Individuals are responsible for security clearance of any material before submission. **ISBN 0-942612-35-3**

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All photos Douglas via Harry Gann, Nick Williams or Craig Kaston unless noted otherwise.

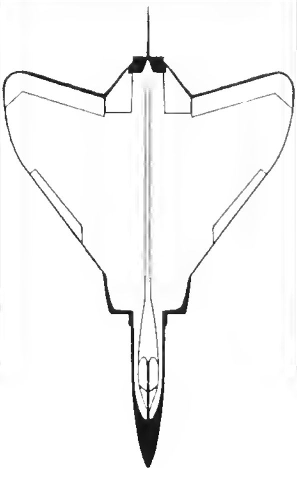
Additional text and research by Richard Koehnen.

DEVELOPMENT

The Douglas F5D-1 Skylancer was a progressive development of the F4D-1 Skyray. It was conceived from testing data prior to the Skyray entering fleet service. In fact, the F5D-1 was originally designated F4D-2N. The F4D-1's and F5D-1's designer, Ed Heinemann, described the Skylancer as "a natural and normal modification of the F4D".

Many people believe that the Skylancer was a faster and better choice than its competitor the Vought F8U Crusader. They believe that it had inherently better stretch potential to the point where it could have outperformed the F-4 Phantom if the J-79 engine had been installed as envisioned by Ed Heinemann.

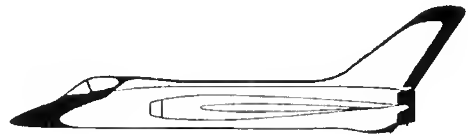
In 1953, Douglas proposed major design changes to improve the F4D-1 and to expand its missions. These



F4D-1 AND F5D-1 SIZE COMPARISON

THE WHITE PROFILE IS THE F4D-1 SKYRAY
THE BLACK PROFILE IS THE F5D-1 SKYLANCER

DIMENSIONS	F4D-1	F5D-1
SPAN	33'6"	33'6"
WING AREA	557sq ft	557sq ft
LENGTH	45'4.75"	53'8"
HEIGHT	13'	14'8"



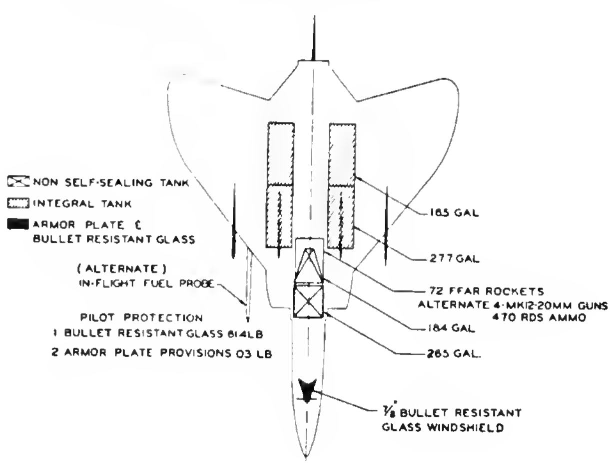
proposals lead to the authorization by BuAer letter of intent AER-CT-65 (016354) dated 16 October 1953 for construction of two airplanes and a static test article. The F5D-1 was conceived as a high performance, carrier based, all-weather fighter-interceptor with fleet release in early 1958.

The Mockup Inspection was held on 10-12 November 1953 and required no major changes. The final detailed specifications were finalized by 9 February 1954 and the guarantees under the interceptor portion called for a max speed at 35,000 feet of 806 knots, time to 40,000 feet of 2.8 minutes and an empty weight of 15,927 lbs. Within six weeks Douglas had estimated the first flight being pushed back three months to January and March of 1956. The first aircraft would have a 16,000 lbs/thrust J57, with production aircraft for the fleet having an upgraded J57 of 17,200 lbs/thrust.

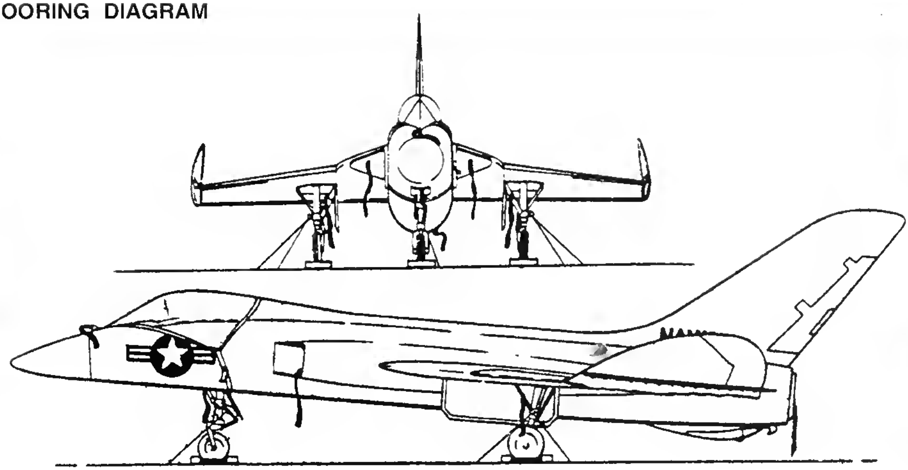
Since the F5D-1 was a follow-on design, it would use the same Pratt and Whitney J57-P-8 that was used in the F4D-1, which enabled the Skyray to set five world climb records. The F5D-1 would also use the identical wing planform as the F4D-1. The significant differences between the F4D-1 and the F5D-1 were the improved aerodynamic lines, including a thinner wing, improved wing-fuselage fillet, a higher fineness ratio fuselage with a new "V" type cockpit enclosure. All these changes would significantly increase the F5D-1's speed by over 63% of that of the F4D-1. Internal fuel capacity was increased by some 54% by adding two integral wing fuel tanks located immediately behind the engine air scoops and by adding a fuselage tank forward of the engine.

While the Skylancer was still on the drawing board, Douglas test pilot Robert Rahn made a high speed pull-out in an F4D-1 in which he experienced a 12G load factor, which so badly wrinkled the wings that the

ARMAMENT AND FUEL TANKAGE

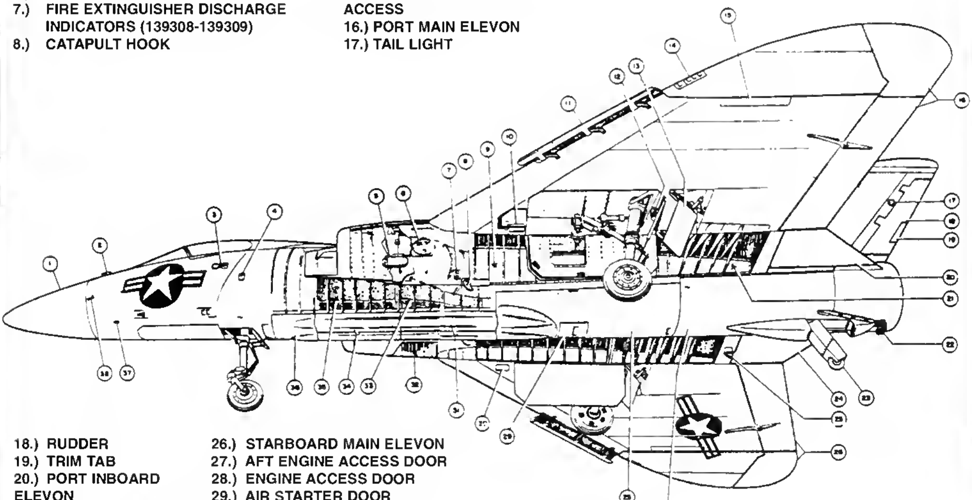


MOORING DIAGRAM



GENERAL ARRANGEMENT

1.) RADOME
2.) PITOT TUBE
3.) EXTERIOR CANOPY CONTROL
4.) EXTERIOR CANOPY JETTISON CONTROL
5.) DROP-OUT HYDRAULIC PUMP
6.) LIOUID OXYGEN TANK
7.) FIRE EXTINGUISHER DISCHARGE INDICATORS (139308-139309)
8.) CATAPULT HOOK
9.) FORWARD WING TANK
10.) EMERGENCY GENERATOR
11.) SLAT
12.) PRESS. FUELING (142349-142350)
13.) SPEED BRAKE
14.) NAVIGATION LIGHT
15.) WING FOLD CONTROLS ACCESS
16.) PORT MAIN ELEVON
17.) TAIL LIGHT



18.) RUDDER
19.) TRIM TAB
20.) PORT INBOARD ELEVON
21.) AFT WING TANK
22.) ARRESTING HOOK
23.) TAIL BUMPER
24.) INBOARD ELEVON
25.) FUEL VENT EXIT
26.) STARBOARD MAIN ELEVON
27.) AFT ENGINE ACCESS DOOR
28.) ENGINE ACCESS DOOR
29.) AIR STARTER DOOR
30.) EXT. PWR. RECT. & SWITCH
31.) AFT ROCKET DOORS
32.) MAIN GENERATOR
33.) AFT SUMP PUMP
34.) FORWARD ROCKET DOORS
35.) FUEL TANK
36.) EQUIP. ACCESS DOOR
37.) STATIC PORT
38.) ANGLE OF ATTACK

The first F5D-1 (139208) being assembled alongside a production F4D-1

Skyray was scrapped. Because of this ,Heinemann gave up the double-skin pillow construction used on the Skyray and developed an integrally stiffened skin milled from a light alloy plate. This skin was .1 inches thick, with stiffening webs of .25 inches by 1.25 inches spaced every two inches.

The Skylancer would be equipped with a Douglas developed auto pilot and power control system similar to the F4D-1. However, the F5D-1 auto pilot incorporated the latest technology and was packaged into a smaller hermetically sealed container.

The fire control system would be much more advanced and complicated than that of the F4D-1. Douglas served as the general contractor for the system and sub-contracted the radar to Westinghouse, the ballistic computer to the Avion division of American Car and Foundry Company, and the compensating gunsight (designed by Douglas) to the A.C. division of General Motors Corporation. Douglas retained the flight data computer and cockpit control box as an in-house project at El Segundo.

In June 1954, Douglas received BuAer dispatch 182101Z, which established first flight dates for aircraft number one in April 1956 and for aircraft number two in June 1956.

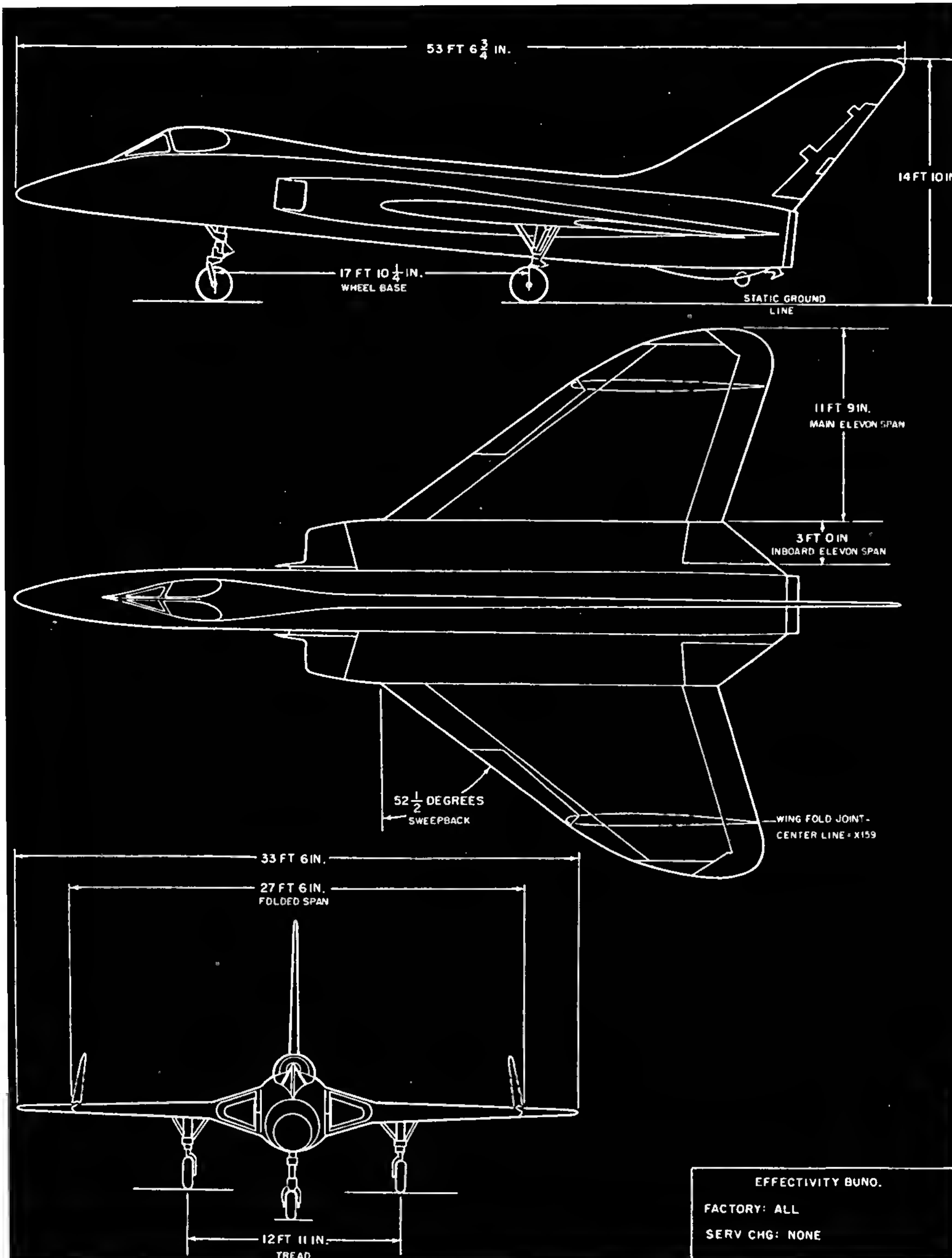
On 3 September 1954, Douglas forwarded a proposal at the request of the chief of BuAer for a contractor furnished fire control system to replace the contract specified government furnished Aero 13G system, which could not be made available in time for the F5D program. On 18 November 1954, BuAer sent Douglas a letter of intent for contract numbers 55-363, AER-CT-423, (022306), which authorized development of the X24A armament control system. This authorization included sufficient equipment, including spares and test equipment, to outfit five test F4D-1 aircraft as well as two F5D-1 aircraft.

The Aero X24A system was designed to permit the operation of the F5D-1 as an all-weather general purpose fighter or interceptor. This system also operated during bombing missions. The system provided for both fully automatic and pilot operation of the aircraft in the attack phase of air-to-air combat. Increased tracking accuracy in combat was obtained by means of the auto-control tie-in. A manual standby system was provided for continuance of the attack under optical conditions if the radar failed or was jammed.

The X24A optical sight and scope were placed in the best attainable position to reduce reflected light from the scope face and to minimize the pilot's angular eye accommodation. Emphasis was placed on displaying optimum steering signals and on obtaining minimum time between detecting a target and actual lock-on. All components were arranged to allow easy access for maintenance. The radar and armament control director featured easily accessible plug-in units. The design provided for rapid testing by means of "go" or "no-go" types of tests. The system design was matched to the characteristics of the F5D-1 to achieve optimum flyability and firing accuracy.

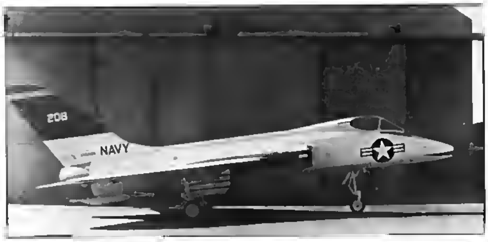
On 17 December 1954, BuAer issued change notice AER-AC-27,

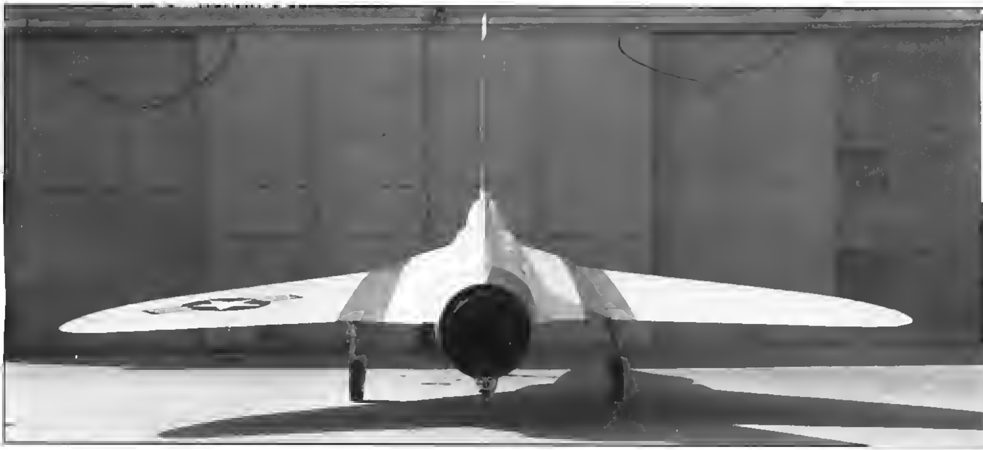
The number three F5D-1 (142349) under construction at the El Segundo plant.


53 FT 6 3/4 IN.
14 FT 10 IN
17 FT 10 1/4 IN.
WHEEL BASE
STATIC GROUND LINE
11 FT 9 IN.
MAIN ELEVON SPAN
3 FT 0 IN
INBOARD ELEVON SPAN
52 1/2 DEGREES
SWEEPBACK
WING FOLD JOINT-
CENTER LINE = X159
33 FT 6 IN.
27 FT 6 IN.
FOLDED SPAN
12 FT 11 IN.
TREAD
EFFECTIVITY BUNO.
FACTORY: ALL
SERV CHG: NONE

F5D-1 (139208) PROTOTYPE WALK AROUND

F5D-1 139208 was painted overall gloss white with red trim and gull grey narrow vertical fin stripe and anti-glare panel. The stripes on the interior of the gear doors and on the canopy were also red. The 208 painted on the tail was white. The tailcone was natural metal. At left, the tightly pinched cockpit enclosure is evident. The wing planform was narrow enough to require only manual folding wing tips. Note the small wheel installed on the tail bumper. The tail bumper is bracketed by the "V" shaped red and white stripe tail hook.






208
NAVY
139208


208
NAVY

024071, (IBCC #D420), which authorized several major configuration changes. Seven changes were listed as follows:

1.) 300 gallon drop tanks added.

2.) Sidewinder missiles added.

3.) Streamlined general purpose bombs added.

4.) Requirement for carrying atomic weapons was added.

5.) An increase in area of the vertical tail was authorized.

6.) A requirement for inflight refueling, both as a tanker and a receiver, was added.

7.) A major increase in the supersonic maneuverability of the airplane was authorized.

Douglas action concerning the mentioned above requirement for Sidewinder, bombs, and atomic weapons was not completed because

Above, the first F5D-1 on its maiden flight on 21 April 1956.

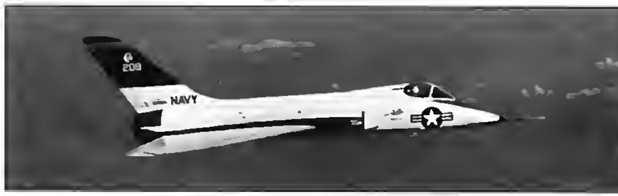
Below, Robert Rahn in 139208 prepares for the first F5D-1 flight. Note the tufted insulation inside the canopy.

F5D-1 139208 on an early test flight from Edwards AFB out over Mohave Desert.

of verbal instructions from BuAer Class Desk early the following year, to the effect that these requirements would soon be deleted.

On 11 March 1955, amendment number eight to letter of intent for Contract NOa(s) 54-321 was issued, adding nine additional F5D-1 airplanes scheduled for first flights at the rate of two per month from January 1957 through November 1957. Unfortunately this authorization was not in accordance with the required lead time and therefore resulted in a gap of seven months between the first flight of the second and third airplanes.

On 18 January 1956, amendment number twelve to letter of intent for contract NOa(s) 54-321 was issued,



Below, F5D-1 139208 being chased by a production F4D-1.

adding eight additional F5D-1 airplanes scheduled for first flights at the rate of two per month in December 1957 through March 1958.

On 5 March 1956, BuAer change notice AER-PP-311, Serial 03764, (IBCC #E853), was issued authorizing installation of the J57-P-14 engine in lieu of the J57-P-8 engine in the last seventeen of the nineteen airplanes on order at that time.

FIRST FLIGHT

On 21 April 1956, the first F5D-1 (139208) made its first flight. Robert O. Rahn was the pilot and had this to say of that first flight: "It took one and a half years to achieve supersonic Mach on the XF4D-1, whereas the F5D-1 went supersonic on its first flight because of the aerodynamic improvements - increased fineness ratio of the fuselage reduced drag; the extended tailcone reduced buffet; the thinner wing reduced drag and tuck under; the larger fin increased directional stability; and the powered rudder eliminated rudder buzz."

In the first 33 days after its maiden flight, the first F5D-1 went aloft 21 times for a total of 24 flight hours. This demonstrated an exceptional rate of availability for a new prototype aircraft. After three months of flight testing at Edwards AFB, the first F5D-1 had completed 50 flights for 57 flight hours. This period included three weeks of no flight operations due to engine overhaul and minor modifications.

During the initial three months of testing only minor changes were made to the aircraft. The wheels and brakes were replaced by those of a different vender as the original ones

Above and at right above, F5D-1 139208 on an early test flight over Edwards AFB in 1956.

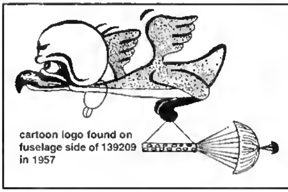
Below, the number two F5D-1 (139209) comes in for a landing at Edwards AFB in July 1956. Note extended tail bumper for landing.

tended to heat up and chatter during application.

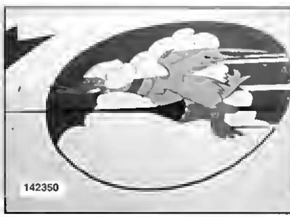
Many negative features of the Skyray were corrected or minimized in the Skylancer design. In the Skyray, transonic tuck-under was quite severe and dangerous at high indicated air speeds. In the Skylancer, the aerodynamic improvements cut the trim change requirements to control tuck-under by more than half. To eliminate the problem completely and to make the F5D-1 into a good gun platform, an automatic trim change compensator was installed.

Under manual flight control, the F4D-1 was a handful and completely unacceptable above 175 knots. Because of this fact, a wind driven pump was installed as backup to the normal dual system and the manual override was eliminated on the F5D.

Many of the above changes were accomplished in October 1956 at the Douglas El Segundo plant. The pitch damper was reworked, the manual flight control system was deleted and replaced by the air driven emergency pump and the full power rudder was



cartoon logo found on fuselage side of 139209 in 1957



142350

Below, 139208 during a preflight service at Edwards AFB. The weapons doors are open as well as the engine door. The aircraft is hooked up to the electrical cart and the portable jet starting unit. Note the simple A4D style boarding ladder. (via Kaston)

added. The aircraft was also strengthened due to data gleaned from the static test program.

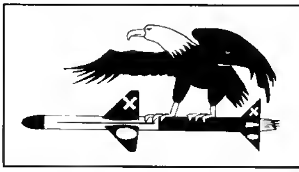
The initial maximum Mach of 1.39 that was achieved with the cambered or blunt leading edge inlet was disappointing and a thinner inlet duct was installed. The new duct increased the Mach by .14. This change, plus an engine "tweaking" job, increased the F5D's maximum level flight Mach to 1.63.

While the number one F5D was being tested, the armament development changed direction on 20 June 1956 when BuAer issued a change notice authorizing a switch from Sparrow I missiles to Sparrow II missiles with space provisions for the Sparrow III. This was followed by the armament test F4D-1 (134754) making its first flight with the complete X24A system on 13 July. On 23 August, armament test F4D-1 (134763) completed a series of flights with dummy Sparrow II missiles, demonstrating launches under simulated attack conditions.

F5D-1 NUMBER TWO (139209)

The number two F5D-1 (139209) made its first flight on 30 June 1956 with Rahn at the controls. On 7

Above and at bottom, F4D-1 134763 ,which was used for armament tests of the Sparrow II missile system for the F5D-1 project. Dummy missiles are mounted on the wing pylons and camera housings are located on the wing tips and the fuselage. The F4D-1 is overall white with red trim and gull grey fin tip, wingwalks and anti glare panel. Radome is faded grey.



November the aircraft attained an observed Mach number of 1.565 in level flight at 40,000 feet. On 9 November the aircraft tested compressor stall characteristics at high altitude (50,000 to 54,000 feet). Heavy buffeting at extreme angles of attack failed to induce compressor stall. These two tests and subsequent tests verified the success of the new inlet design, which both improved speed and prevented compressor stalls.

Douglas pilots were joined by five Patuxent River test pilots, headed by CDR Tom Gallegher, who flew 28 evaluation flights in the first two aircraft from 10 to 17 July 1956. The discrepancies noted by these pilots were quickly addressed and corrected, and the Skylancer enjoyed a fairly uneventful development program. The only items not corrected immediately were supersonic yaw, stall characteristics and trim change with speed brake operations. Only

Above and below, the number two F5D-1 (139209) shortly after completion in the same overall scheme of white with red trim and a thin grey vertical fin stripe and anti-glare panel.

Douglas pilots had investigated stalls and they had considered them satisfactory, so stall characteristic corrections were not addressed. The only discrepancy not addressed was the trim change with speed brake operations, which would require minor

modification of the dive brake system to more closely synchronize the deployment of the upper and lower units.

In July, it was disclosed that X24-A costs had escalated faster than anyone had imagined, $13,500,000 to $34,395,000 with expected costs to top $50,000,000. This was followed in August and September by more bad news. Douglas moved the fleet delivery date from July to October 1958 and informed BuAer that the F5D-1 combat radius and mission time would be 25% less than contracted for. Additionally, the X-24A system would be delayed another six months mainly because of WECO components.

On the day the NATC test pilots arrived, the first Skylancer, 139208, caught fire. The ground fire severely damaged the lower fuselage, intake duct, and leading edges. Douglas assembled an emergency repair team of some thirty mechanics, and worked around the clock for six days repairing the Skylancer in time for the Navy pilots to conduct eight evaluation flights. Prior to turning over the aircraft to the NATC pilots, Douglas project test pilot Tom Kilgariff conducted a thorough two-hour check flight.

The second Navy Preliminary Evaluation (NPE) was conducted from 26 March through 5 April 1957. During the second NPE, the three completed F5D-1s (139208, 139209, and 142349) were flown simultaneously. The Navy test pilots cleared the aircraft for production with certain modifications.

NAVY PROCUREMENT ENDED

The beginning of the end for the F5D-1 program came during the first week in October 1956. BuAer Op-50 under B. E. Moore, Director Aviation Plans Division, again reviewed the F5D-1 program. He felt they had three options:

A.) Continue with present planned procurement.

B.) Cancel plans for the F5D, effecting maximum dollar savings.

C.) Reduce program to minimum number of aircraft on which fabrication is pretty far advanced.

His arguments are interesting, as he considered their mission at hand and yet was very cognizant in what the politicians would think of the Navy's actions and the precedence it might set. It also disputes the numerous times since then, when retired Douglas personnel wrote how the F5D was killed for the procurement of more Vought F8U-1 "Crusaders". Never once is the F8U mentioned in the papers as a replacement for the F5D. The coming decision on the F5D would be based on the following arguments:

1.) If we proceed with procurement (F5D-1) as planned, we will obtain an all-weather fighter with considerable performance increases which will be operational in the Fleet probably for the time period 1959-1963. Our total number of F5D aircraft procured will be about 200-250 procured for fiscal years '58, '59 and '60, with peak procurement in fiscal year 1959 and a taper-off in 1960 as we make the first initial large procurement of either the F8U-3 or the F4H. With the development of a supersonic all-weather fighter which includes its own guided missile (Sparrow II), it will make this an extremely expensive model.

2.) If we cancel procurement of the F5D at the quantity of two now flying, we will save the maximum amount of funds but this will be done at the expense of modernity. Our all-weather squadrons will be equipped with subsonic aircraft across the board from now through 1961, when initial deliveries of F8U-3/F4H may begin. Also, we have made a strong case and sold it that to expedite the introduction of a new model (Robertson Plan) we must buy larger initial numbers to expedite the evaluation. Cancelling a model with procurement of only two aircraft will, in my opion, kill any possibility of buying more than two articles of any future models. We will have in essence proved that you can make up your mind with the procurement of only two aircraft in the eyes of the fiscal reviewers.

3.) If we take delivery of the number of aircraft for which Douglas has cut metal, which BuAer indicates is about 11 aircraft, we will accomplish the following:

A.) Large dollar savings to be applied against acceleration of the F8U-3, the new replacement seaplane, and production of needed models, probably the A4D/FJ-4B.

B.) We will obtain a sufficient number of F5Ds to conduct an adequate evaluation and have an aircraft model far along in elimination of defects which could go into production on a crash basis if the international situation deteriorated to the point where this was warranted between now and 1960-61.

C.) We would carry out the firm plan which envisaged procurement of a sufficient quantity initially and then wait on production until the model had been evaluated.

4.) I recommend the course of action in C. above, obtain 11 F5Ds, continue an orderly Patuxent evaluation and determination of needed fixes. The expenditure of $37,000,000 over the funds which would be saved under course A. can, I feel sure, be fully justified as a pure insurance premium for the interim period until a better all-weather fighter, the F8U-3/F4H can be put into production.

5.) If my recommended course of action is taken, the Sparrow II program should be put on the same basis. That is, procurement and continued development only of an evaluation quantity of missiles.

On 15 October 1956, the DCNO (Air) made the decision that there was no fleet requirement for the F5D-1 and that production was to be limited. The 43 aircraft initiated in July were never amended into the contract, and Douglas was ordered to slow down the production of the last eight aircraft

contracted for.

On 9 November 1956, BuAer met with Assistant Secretary of the Navy (Air) Norton to discuss the future of the F5D-1. The result was that B. E. Moore's recommendations from 9 October were being implemented. The program would continue only with eleven aircraft to finish the weapons development. Funds already allocated to the F5D-1 and Aero X-24A ACS system, not used in completion of the eleven aircraft, would be used in procuring additional F3Hs to cover the interim period, until either the F4H-1 or F8U-3 would become operational with the fleet.

The following week, from 14-16 November 1956, BuAer held a conference with all its interested parties, and those from Douglas divisions, concerning implementation of an eleven plane test program as required by the Chief of Naval Operations (CNO). Agreement was reached concerning the aircraft performance, schedules and overall status, and a schedule and utilization table was agreed upon on the use of eleven aircraft to develop the weapon system, and a variation which would only develop the missile version of the F5D-1.

In order to move the F5D-1 into an "on-the-shelf" status, the eleven aircraft would be completed and full Board of Inspection and Survey (BIS) trials would be conducted. Best estimates for this occurring would be early 1959, but the X-24A system would not be ready for BIS until late 1959. The on-the-shelf status was somewhat misleading, as even with eleven aircraft completed and BIS behind them, it would take Douglas thirty months from go-ahead until the aircraft could be released to the fleet due to production lead times.

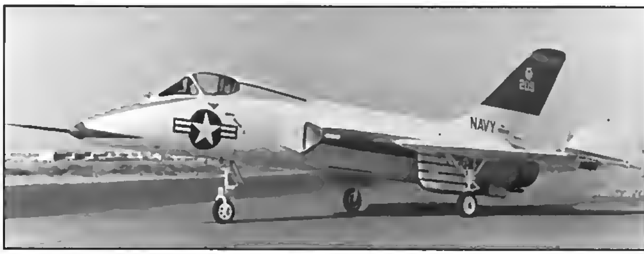
Originally, only two aircraft were ordered along with a static test article. This was followed by an order for an additional nine aircraft on 11 March 1955. Then on 18 January 1956 eight more F5D-1s were ordered, bringing the total to nineteen aircraft. These orders were placed to insure that enough aircraft were procured to equip one fighter squadron. However, dwindling defense budgets won out and the last eight F5D-1s were cancelled on 1 December 1956. This was followed on 1 March 1957 by the complete cancellation of the program after completion of the fourth aircraft (142350).

CONTINUED NON-NAVY USAGE

On 20 August 1957, BuNo 139208 and 142350 were flown to the

Above, close-up of very simple F5D-1 wingfold mechanism. (Craig Kaston)

The wings are folded and spread manually and locked mechanically. The wing folding controls are located in each wing at the wing fold joint. Access to the wing folding controls is through a hinged door on the bottom surface of each wing, midway between the leading and trailing edges at the wing fold joint. Opening the access door exposes the elevon lock and wing pin pulling handles.



Above and below, 139209 on the ramp at Edwards AFB shortly after its completion. Wings are folded and the aft tail bumper fairing is missing. The tailhook is fitted with a test device of unknown usage.

Above, the three completed F5D-1s (139208, 139209, and 142349) take off in formation during the Navys second NPE. 142349 is nearest the camera with mock-up Sparrow missiles mounted on the wings. Below, all four completed Skylancers on the ramp at Douglas. From left to right; 139208, 142350 with black radome, 142349 with grey radome, and 139209.

Below, 209 foreground and 208 background have canopy braces which are absent on 349 and 350. 349 and 350 have missile pylons mounted on their wings. See color front cover for markings.

National Advisory Committee for Aeronautics (NACA) at Moffett Field for usage in high speed research projects. BuNo 139209 and 142349 were bailed back to Douglas for use as high speed chase and utility planes. Ten months later, in June 1958, these two were sent to NACA also.

According to an unsubstantiated report from an ex F-8 pilot and Douglas employee, during the ten months Douglas had control of 139209 and 142349 they were secretly deployed to Japan. According to him the two aircraft were sent to Japan because of their excellent climb-to-altitude times. It seems that U-2 overflights of the Chinese mainland had occasionally returned at less than maximum altitude due to either engine problems or gliding back out of fuel. The US needed a non-military aircraft capable of providing top cover as they skirted down through Chinese airspace toward Japan. Ten months would have been enough time to put together a maintenance team and a couple of civilian contract pilots for such a project. The issue would have been what they would have used for armament?

Above and below, the third F5D-1 (142349) ended up as a spare parts bird at Ames NASA after flight testing with clipped wing-tips. Note that the folding portion of the wing has been removed and a fiberglass wing-tip cap has been added. The aircraft was overall white with red trim except for the grey fin tip and grey radome. (Peter M. Bowers collection via Nick Williams)

F5D-1 MISSION AND DESCRIPTION

The primary mission of the F5D-1 was that of a high performance, all-weather fighter capable of operating from all attack types of aircraft carriers and from land bases.

Propulsion was provided by a Pratt and Whitney J57-P-8 axial flow gas turbine engine with afterburner thrust of 16,000 pounds.

The tailless configuration of the aircraft created the need for an unconventional control surface arrangement consisting of elevons, rudder, and slats. A tail bumper wheel was provided in addition to a conventionally arranged tricycle landing gear to prevent the tail cone from striking the deck or runway during landing at the high angles of attack inherent in the tailless configuration.

Armament consisted of seventy-two internally carried two-inch diameter, folding fin stabilized rockets, mounted in four retractable rocket doors. Alternate armament equipment, consisting of four 20MM cannon or two air to air missiles, may be installed.

DIMENSIONS

Length	53'9"
Height	14'10"
Tread	12'11"

Wing:

Area	557 sq. ft.
Span	33'6"
Span folded	27'6"
M.A.C.	219"
Sweepback	52.5°

WEIGHTS

Empty	17,444 lbs.
Basic	18,147 lbs.

Take-off with full internal fuel and 72 2" rockets 27,739 lbs.

Take-off as above with 2 Sparrow II missiles added 28,789 lbs.

Maximum take-off weight as above with two 150 gal. external wing tanks added 31,204 lbs.

FUEL SYSTEM

Usable fuel	1,333 gal.
Wing tanks	277 X 2 = 554 gal.
Wing tanks	165 X 2 = 330 gal.
Forward fuselage	265 gal.
Aft fuselage	184 gal.
Oil	3 gal.

ELECTRONICS

UHF	AN/ARC-27A
Nav. Rec.	AN/ARN-21
Radio Altm.	AN/APN-22
IFF	AN/APX-6B or AN/APA-89
Fire control	Aero X24A system
Radar	AN/APQ-64
Arm. Cont. Dir.	Aero 12A
Sight	Aero 1A

WING SLATS

Slats are installed on the leading edge of the wings to improve lateral and directional stability and control during take-off, approach and landing. The slats are fully automatic, opening and closing in response to aerodynamic forces usually between 205 and 325 knots.

CATAPULT WIND REQUIREMENTS

The wind required for C11-1 catapult take-off with military power is 2 knots for the rocket loaded fighter and 25 knots for the maximum take-off weight with external tanks.

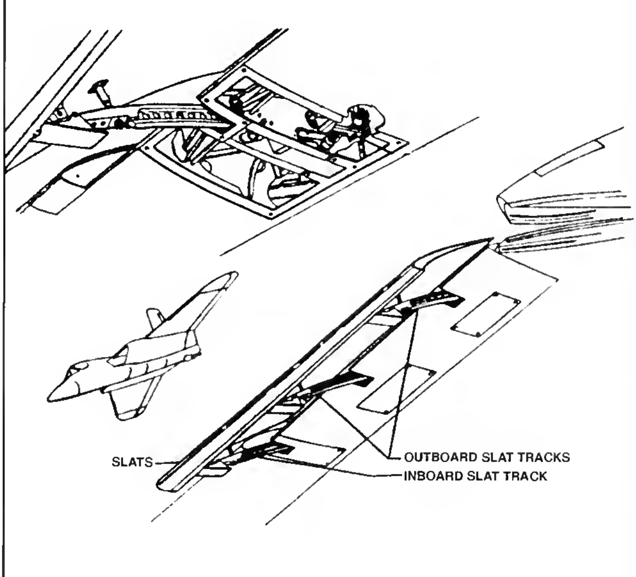
ARRESTED LANDING WIND REQUIREMENTS

Approach speed 135 to 145 knots with MK 7 Mod 1-3 arresting gear.

Internal armament and 1,247 lbs. of reserve fuel 27 knots

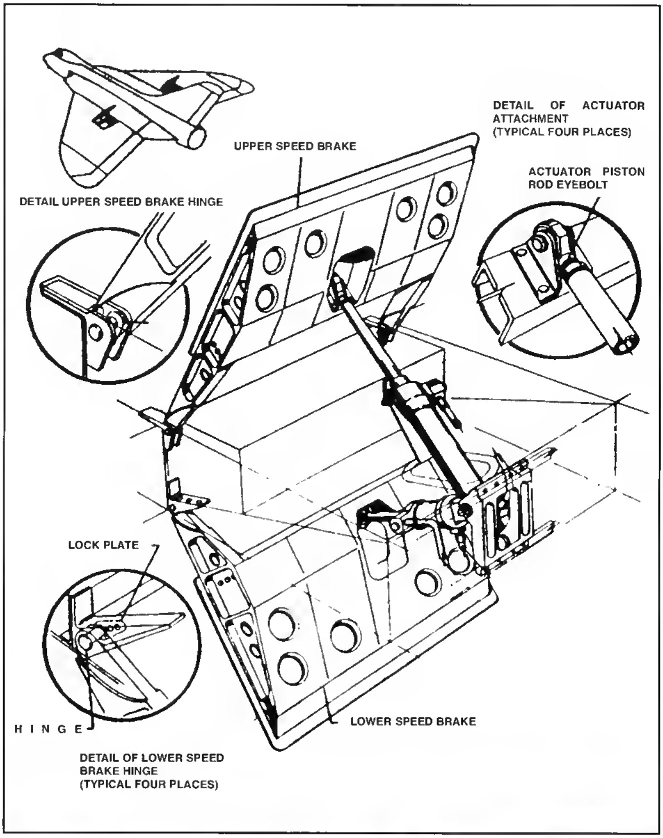
As above with 1,803 lbs. of reserve fuel 31 knots

WING SLATS

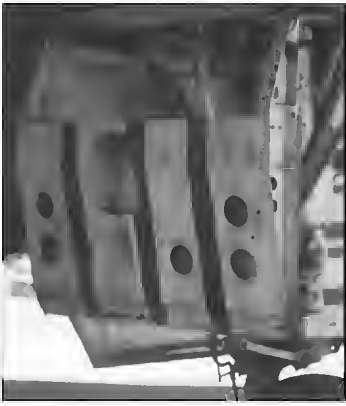


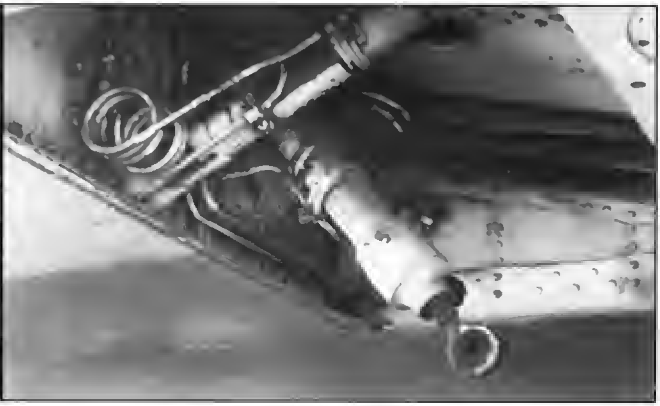
UPPER AND LOWER SPEED BRAKES

Four speed brakes are installed on the aircraft, one on the upper and lower surface of each wing. The speed brakes are actuated by elevon hydraulic system pressure and controlled by a two position Speedbrake switch mounted on the throttle grip. To open the speedbrakes, the switch is moved aft to the "OPEN" position; to close them, the switch is moved forward to the "CLOSED" position. As the Speedbrake switch has only two positions, the speedbrakes cannot be stopped at any intermediate point between fully opened or fully closed. The speedbrakes may be opened at any speed. A "blow-back" feature is incorporated which allows the speedbrakes to begin to close when the air load against them causes the hydraulic pressure in the actuating cylinders to exceed the pressure at which the "blow-back" relief valve opens, thus preventing damage to the speedbrake system. The speedbrakes will begin to blow-back at an indicated airspeed of approximately 380 knots. The speedbrakes require approximately two seconds to open or close.



Below, lower speedbrake interior detail on NASA 708. Speedbrake is white with red stripes and is disconnected from its actuator. Below at right, lower speedbrake recess showing speedbrake actuators and mechanisms. (Craig Kaston)

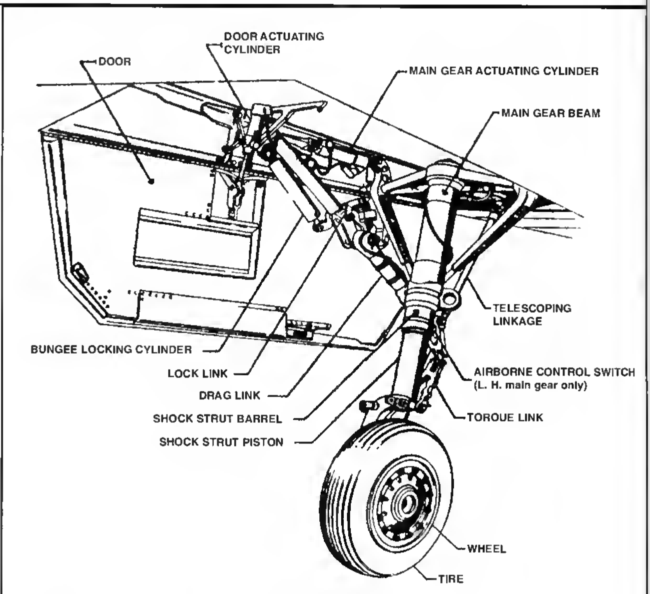




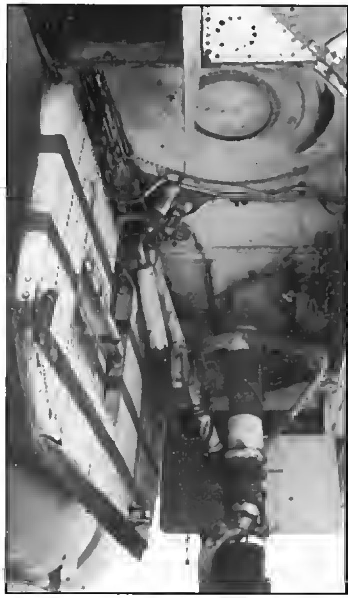
MAIN LANDING GEAR

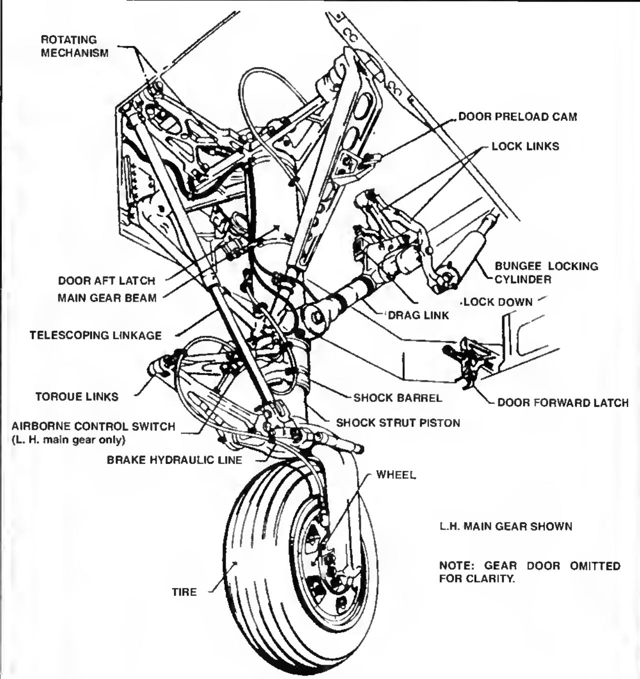
The main gear retracts forward, the wheels rotating ninety degrees and the shock strut telescoping to allow the gear to fit flush into the wings. When retracting, the main gear is held in the retracted position by hydraulic pressure in the retraction cylinders and by the wheel well doors. The landing gear and wheel well doors are actuated by utility hydraulic system pressure. All main landing gear doors remain extended when the gear is down.

Emergency extension of the landing gear is accomplished by mechanically releasing the wheel well doors 'up latches, by-passing the landing gear sequence valve retraction lines, and the effects of gravitational and aerodynamic forces. The normal landing gear control must be in the "DOWN" position in addition to pulling out the "EMER LDG GR" handle to effect emergency landing gear extension.



Below, main landing gear bay and door detail. (Craig Kaston)

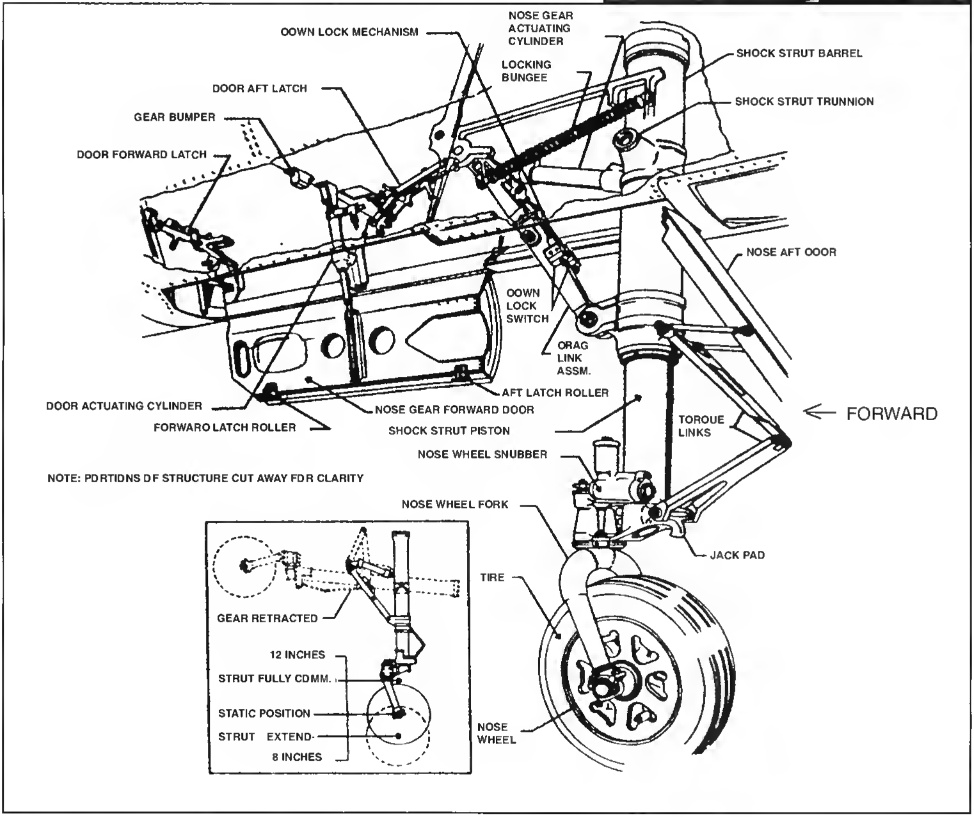




The nose gear retracts forward into the fuselage and is retained in the retracted position by hydraulic pressure and the nose wheel well door. All landing gear wheel well doors remain extended when the gear is down except the forward nose gear door, which is retracted to prevent severing the barrier engagement strap in the event of a barrier crash.

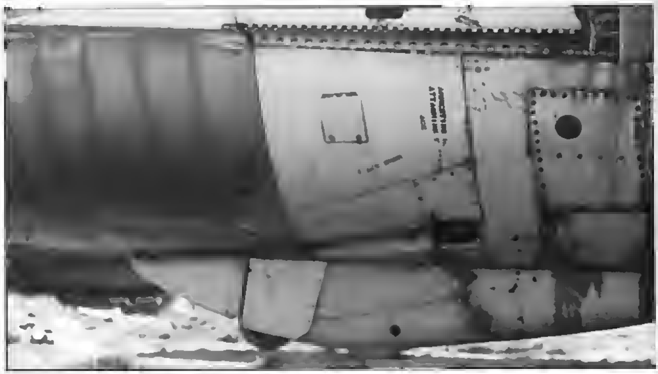
The landing gear is extended or retracted by moving the landing gear control to "UP" or "DOWN". When the landing gear control is placed in the "UP" position, a red light in the wheel shaped control handle will illuminate until all four units of the landing gear are up and locked. When the landing gear control is placed in the "DOWN" position, the red light will illuminate until the tail bumper is extended and the main and nose gear are down and locked. A solenoid-operated safety latch is provided to prevent inadvertent retraction of the landing gear when the aircraft is on the ground.

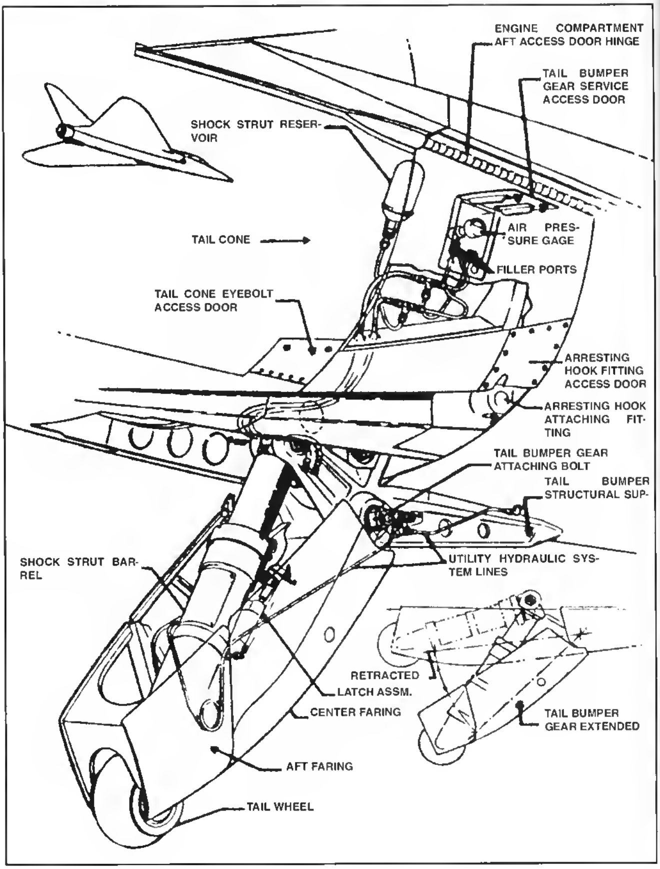
At right, nose gear with colapsed oleo strut. (Craig Kaston)



TAIL BUMPER GEAR

The tail bumper gear is extended pneumatically and retracted hydraulically. A tail bumper sequencing switch automatically retracts the tail bumper when the weight of the aircraft is on the main landing gear struts. The tail bumper retracts upward into the tail cone assembly. A wheel position indicator is provided on the instrument panel. When all units of the landing gear are locked up, the word "UP" appears in the indicator. When all landing gear units are locked down, a miniature wheel appears. If any unit is not locked in either position, a cross-hatched warning signal is visible. By using the landing gear indicator selector switch you can determine the errant unit. The switch is labeled "N" (nose), "L" (left), "ALL", "R" (right), and "T" (tail).





ARRESTING GEAR

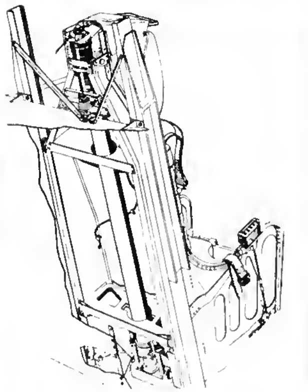
An externally mounted arresting hook is installed in a fairing on the lower aft engine door structure. The arresting hook control on the right-hand cockpit rail controls the operation of the arresting hook. When the control is moved to "DOWN", the arresting hook is mechanically unlatched and hydraulic retraction pressure is relived, allowing pneumatic pressure in the hold-down unit to extend the hook. With the arresting hook extended, the relief valve and orifice provide snubbing action to keep the hook on the deck during arrested landings. A red light in the hook-shaped handle of the control will illuminate when the control is moved to "DOWN", and will go out when the hook reaches the fully extended position. The "UP" position of the control mechanically positions the arresting hook control valve so that utility hydraulic pressure enters the lower chamber of the hold down unit, overriding the air pressure and causing the hook to retract and latch.

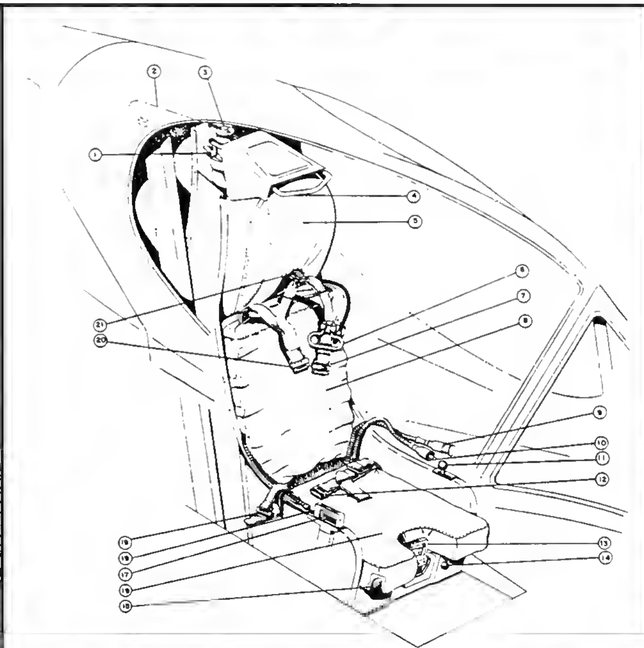
WING PIN LOCK INDICATORS

Two red "warning flag" indicators are located on the upper wing inboard of the wing fold joints.

CANOPY AND EJECTION SEAT

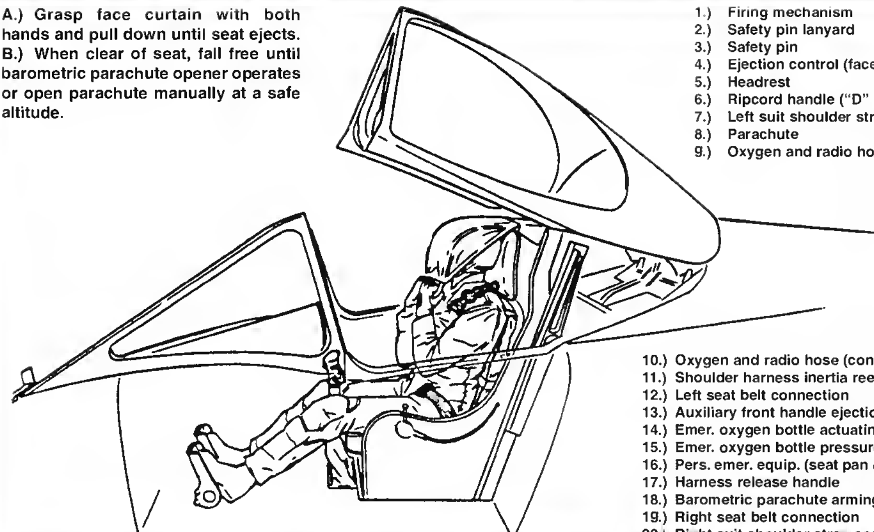
Ejection Seat From Behind





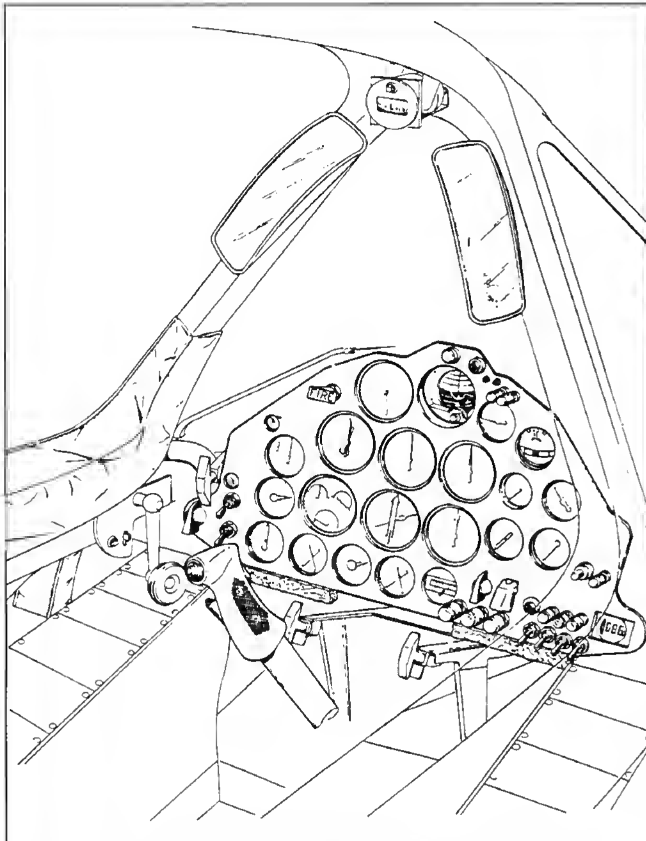
A.) Grasp face curtain with both hands and pull down until seat ejects.
B.) When clear of seat, fall free until barometric parachute opener operates or open parachute manually at a safe altitude.

1.) Firing mechanism
2.) Safety pin lanyard
3.) Safety pin
4.) Ejection control (face curtain)
5.) Headrest
6.) Ripcord handle ("D" ring)
7.) Left suit shoulder strap conn.
8.) Parachute
9.) Oxygen and radio hose (mask)

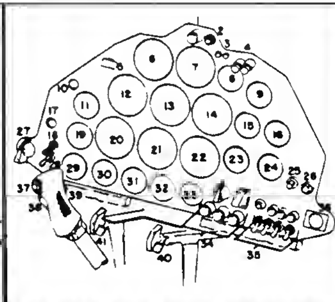


10.) Oxygen and radio hose (console)
11.) Shoulder harness inertia reel control
12.) Left seat belt connection
13.) Auxiliary front handle ejection control
14.) Emer. oxygen bottle actuating handle
15.) Emer. oxygen bottle pressure gage
16.) Pers. emer. equip. (seat pan & pararaft)
17.) Harness release handle
18.) Barometric parachute arming lanyard
19.) Right seat belt connection
20.) Right suit shoulder strap connection
21.) Inertia reel connection

F5D-1 INSTRUMENT PANEL FOR 142349 AND 142350



139208 and 139209 instrument panels are identical except for a few less switches



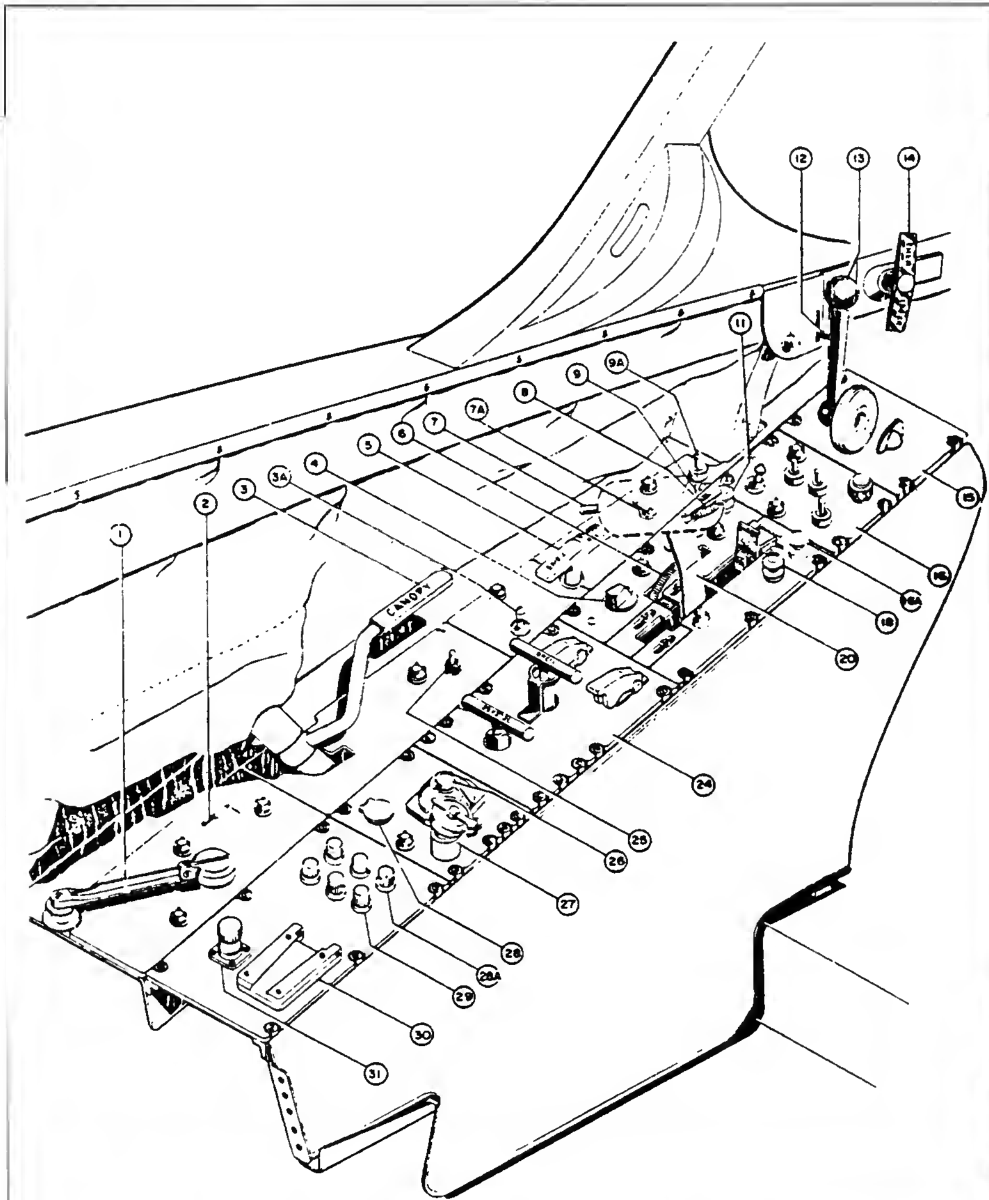
PILOT'S LEFT-HAND CONSOLE 142349 & 350

1.) Mechanical advantage changer control
2.) Mech. advantage changer ind. window
3.) Interior canopy control handle
3A.) Transonic trim switch
4.) Rudder trim control
5.) Emergency stores release handle
6.) Throttle friction and lock control
7.) Master exterior light switch
8.) Speed brake switch
9.) Microphone switch
9A.) Vertical gyro erection switch
10.) Deleted 11.) Engine starter
12.) Landing gear retraction release control
13.) Landing gear control handle
14.) Emergency landing gear release handle
15.) Face mask temperature control
16.) Engine control panel
17.) Deleted 18.) Yaw damper switch
19.) Deleted 20.) Throttle lever
21, 22, 23.) Deleted
24.) Spin and drag chute control panel
25.) Oxygen control
26.) Anti-blackout control panel
27.) Anti-blackout suit hose receptacle
28.) Personal gear adapter
28A.) Fuses: yaw damper, ign. & fuel flow
29.) Spare Fuses
30.) Stowage receptacle (interim) for pressure suit oxygen regulator
31.) Face mask heater connection

INSTRUMENT PANEL LEGEND:

1.) Master warning light
2.) Master warning test switch
3.) Slats position indicators
4.) Gear door gapping indicators
5.) Fire warning light
6.) Airspeed indicator
7.) Remote attitude indicator
8.) Accelerometer (standard)
9.) Turn and bank indicator
10.) Speed brakes indicator
11.) Tachometer
12.) Altimeter
13.) Mach number indicator
14.) Accelerometer (flight test)
15.) Sump tank fuel quantity gage
16.) Liquid oxygen gage
17.) Wheels position indicator
18.) ARC-27 switch (U.H.F.)
19.) Tail pipe temperature indicator
20.) Rudder, elevon and M.A.C. ind.
21.) ID-250/ARN course indicator
22.) Force indicator
23.) Total fuel quantity indicator
24.) Cabin differential pressure gage
25.) Fuel quantity test switch
26.) Canopy unlocked light
27.) Landing gear position ind. selector
28.) Film switch
29.) Pressure ratio gage
30.) Oil and fuel pressure gage
31.) Oil temperature gage
32.) Elevon & utility hyd. pressure gage
33.) Counter
34.) TOP ROW, left to right:
Force gage selector switch
Remote attitude caging switch
BOTTOM ROW:
Ignition on light
Exhaust nozzle position lights
35.) TOP ROW:
FM CALIB indicator light
INSTR FAIL indicator
OSCIL FAIL indicator
CAM BLINK Indicator
BOTTOM ROW:
FM-FM switch
INSTR switch
OSCIL switch
CAM switch
36.) Film remaining indicator
37.) Stick trim switch
38.) Bombs ("B") button
39.) Guns-rockets trigger switch
40.) Auto control release handle
41.) Canopy jettison handle

PILOT'S LEFT-HAND CONSOLE FOR 142349 AND 142350

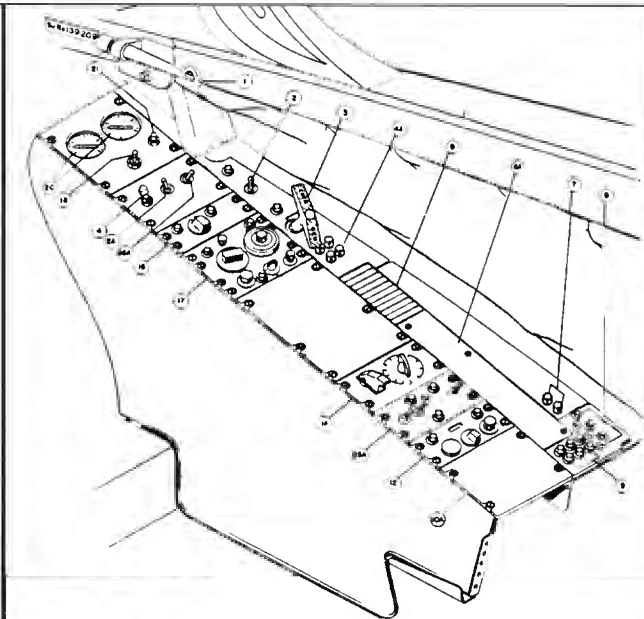


Pilot's left-hand console for 139208 and 139209 is identical except for location of face mask heater connection

PILOT'S RIGHT-HAND CONSOLE

PILOT'S RIGHT-HAND CONSOLE 139209

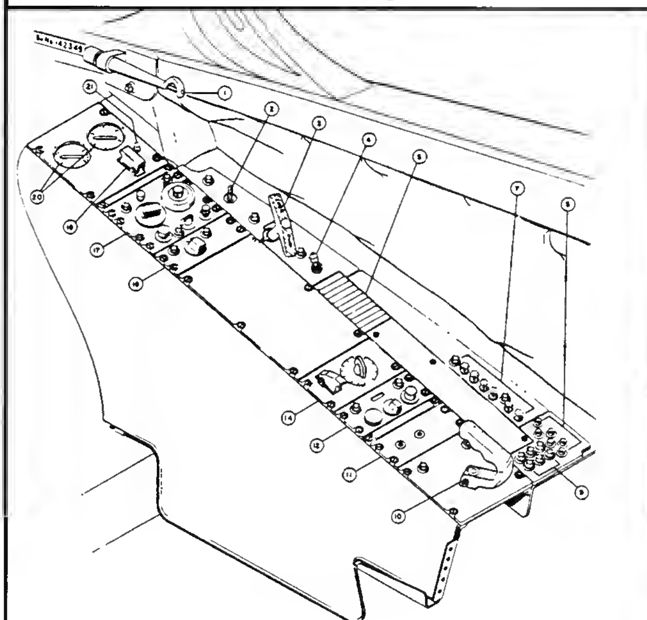
1.) Arresting hook control
2.) Seat switch
2A.) Cabin air temperature switch
3.) EMERgency GENerator release handle
4.) Air conditioning switch
4A.) Fuses
5.) Master warning annunciator
6A.) Blank
7.) Spare fuses
8.) Spare instrument lamps
9.) Spare console lamp
10.) Deleted 10A.) Blank
11.) Deleted
12.) MA-1 compass controller
13.) Deleted 13A.) External lights control panel (inoperative)
14.) Impulse generator control panel
15.) Deleted
16.) Air conditioning control panel
16.) Windshield defog switch
17.) ARC-27A (UHF) control panel
18.) Auxiliary fuel selector switch
19.) Deleted
20.) Auxiliary fuel quantity indicators
21.) Fuel quantity push-to-test switch



RIGHT-HAND CONSOLE ON 139208 IS IDENTICAL TO THAT OF 139208 LESS THE WINDSHIELD DEFOG SWITCH

RIGHT-HAND CONSOLE 142349 & 142350

1.) Arresting hook control
2.) Seat switch
3.) Emergency generator and hydraulic pump release handle
4.) Air conditioning switch
5.) Master warning annunciator
6.) Emergency electric hydraulic pumps switch
7.) Spare fuses
8.) Spare instrument lamps
9.) Spare console lamps
10.) Manual fuel valve control
11.) Interphone outlets
12.) MA-1 compass controller
13.) Deleted
14.) Impulse generator control panel
15.) Deleted
16.) Air conditioning control panel
17.) ARC-27A (UHF) control panel
18.) Auxiliary fuel selector switch
19.) Deleted
20.) Auxiliary fuel quantity indicators
21.) Fuel quantity push-to-test switch



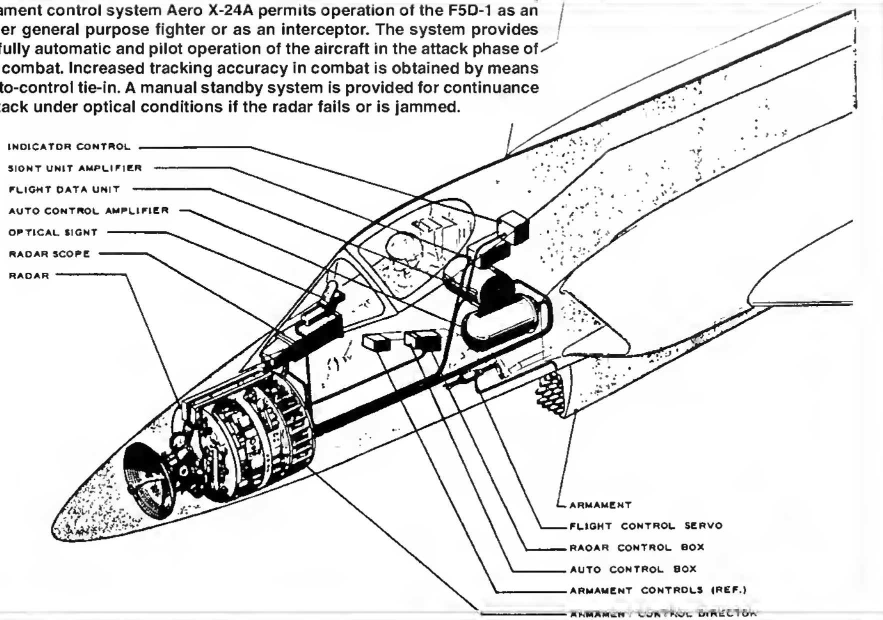
PRODUCTION COCKPIT MOCKUP ON 3-1-57 WITH X24A GEAR INSTALLED

F5D-1 PRODUCTION RIGHT-HAND CONSOLE MOCKUP, FRONT

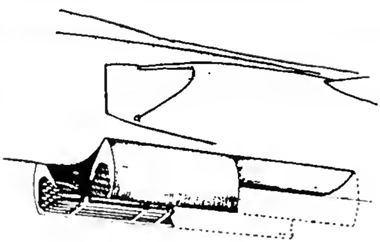
F5D-1 PRODUCTION RIGHT-HAND CONSOLE MOCKUP, AFT

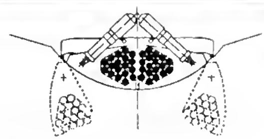
PROPOSED AND ALTERNATE F5D-1 ARMAMENT

The armament control system Aero X-24A permits operation of the F5D-1 as an all-weather general purpose fighter or as an interceptor. The system provides for both fully automatic and pilot operation of the aircraft in the attack phase of air-to-air combat. Increased tracking accuracy in combat is obtained by means of the auto-control tie-in. A manual standby system is provided for continuance of the attack under optical conditions if the radar fails or is jammed.



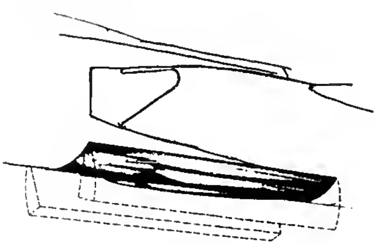
2-INCH ROCKETS

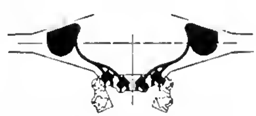




SEVENTY-TWO GIMLET OR REDSTONE high velocity air-to-air rockets are carried internally in the four armament bay doors. Each door contains eighteen rockets. Upon impulse from the trigger switch, the forward pair of doors opens and the thirty-six rockets are fired. This sequence is completed in 0.35 seconds. The empty doors close in 3.5 seconds. A second impulse of the trigger switch activates the second pair of doors and the remainder of the rockets are fired.

20MM GUNS

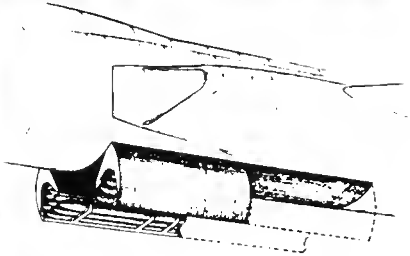


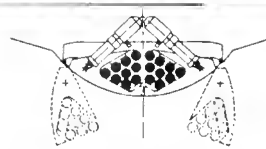


FOUR 20mm MK.12 MOD.0 GUNS are housed in two special gun package armament bay doors. The guns are in firing position when the doors are closed; 125 rounds of ammunition are provided for each gun in reel-type boxes which are mounted in the wing fillet. Ammunition loading is accomplished through doors in the wing upper surface. The armament bay doors are opened to service the guns.

PROPOSED AND ALTERNATE F5D-1 ARMAMENT

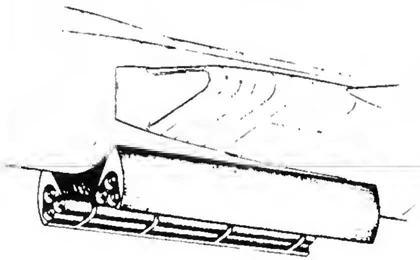
2.75-INCH ROCKETS

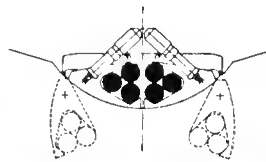




THIRTY-SIX MIGHTY MOUSE ROCKETS can be carried internally in the four armament bay doors, with nine rockets in each door. The firing cycle after the trigger switch impulse is as follows: one pair of doors is opened, the rockets are fired, and the empty doors are closed. The second pair of doors operates on the next impulse from the trigger switch.

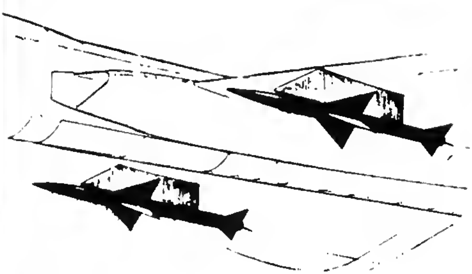
5-INCH ZUNI ROCKETS

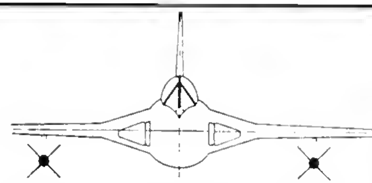




SIX 5-INCH ZUNI HIGH VELOCITY, AIR-TO-GROUND SUPPORT ROCKETS can be carried internally in the armament bay doors. Three rockets will be carried on each side, the two doors operating as a single unit. The firing cycle after the trigger switch impulse is as follows: the doors are opened, the desired number of rockets are fired, and the doors are closed.

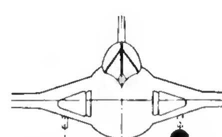
SPARROW IA MISSILES





TWO SPARROW IA air-to-air beam-riding guided missiles are carried at external rack stations on Aero 1A (Douglas 1297F) launchers. The launching airplane guides the missile after release by line-of-sight radar.

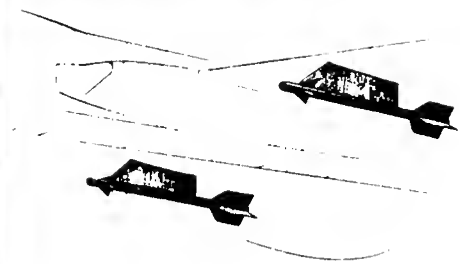
NAVPAC

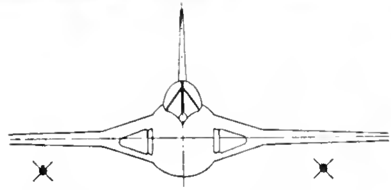


ONE NAVIGATION PACKAGE is carried at the left external rack station during ferrying operations within the continental United States. The package contains an AN/ARN-14E VOR receiver, an AN/ARN-12 marker beacon receiver, and antennas.

ALTERNATE ARMAMENT

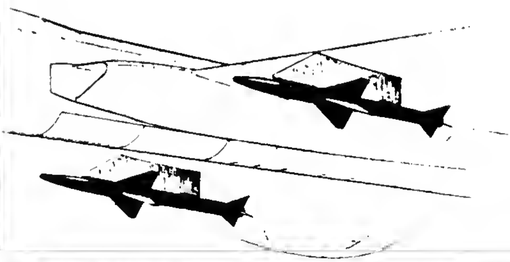
SIDEWINDER

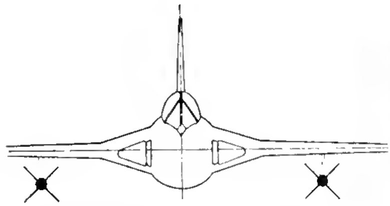




TWO SIDEWINDER passive infra-red homing air-to-air guided missiles can be carried at the external rack stations.

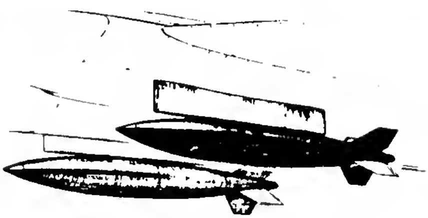
SPARROW II

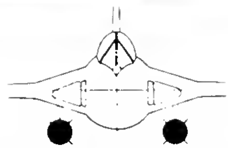




TWO SPARROW II XAAM-N-3 air-to-air supersonic active target seeker missiles can be carried at the external rack stations.

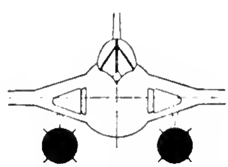
MARK 80 TYPE BOMBS





TWO MARK 80 SERIES (FORMERLY "EX") DEMOLITION-TYPE BOMBS with Aero 1A streamline shapes and Aero 1A electric fusing gear can be carried at the external rack stations on Douglas 4-hook ejector racks. All existing Mark 80 bombs (Mark 81, 82, 83 or 84) can be carried on the airplane.

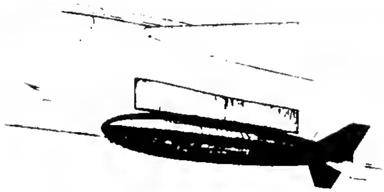
300 GALLON DROPPABLE TANKS

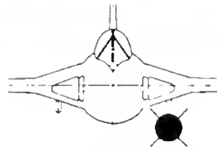


TWO 300-GALLON AERO 1A EXTERNAL FUEL TANKS can be carried at the external rack stations either on 3-hook or 4-hook ejector racks. Pressure fueling connections will be provided in the tanks.

SPECIAL WEAPONS

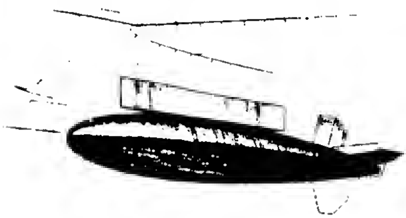
1050 LB STORE

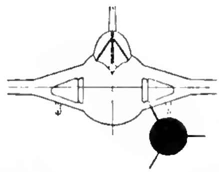




A 1050 POUND STORE can be carried on either a 3-hook or 4-hook ejector rack. Adequate ground clearance is provided with the fins in the extended position.

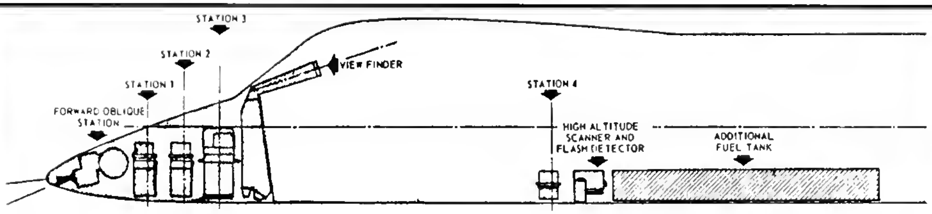
1660 LB STORE





A 1660 POUND STORE can be carried on either a 3-hook or 4-hook ejector rack. The store fins are rotated 30° and the bottom fin folds for ground clearance. The fin rotating provisions and folding mechanism are incorporated in the present store.

PHOTOGRAPHIC AIRCRAFT PROPOSAL



FORWARD OBLIQUE STATION Adjustable at time of installation

(1) K-25-15" or
(1) CAX-2-6" or
(1) MITCHELL 35 MM 2", 4", or 6"

STATION 1- Rotatable in flight

(1) CAX-12-1½" or 3" or
(1) CAX-12-6" or
(1) CAX-12-12"

STATION 2 - Rotatable in flight

(1) CAX-12-1½" or 3" or
(1) CAX-12-6" or
(1) CAX-12-12" or
(1) K-47-12"

STATION 3 - Fixed mount accommodating cameras for trimet or vertical installation only

(3) CAX-12-1½" or
(1) CAX-12-3", 6" or 12"

STATION 4 - Fixed mount

(1) K-17c-6" or
(1) T-11 or
(1) CAS-2A-100 MM, 7" or 12" or
(1) CAX-12-6" or 12"

An alternate installation may be provided for the CAX-12 cameras in a stabilized mount.

BASIC PHOTOGRAPHIC MISSIONS

- CARTOGRAPHIC
- NIGHT PHOTOGRAPHY
- GENERAL RECONNAISSANCE
- BEACH RECONNAISSANCE

THE VIEWFINDER will provide for both a wide angle and a narrow angle optical system. The drift reticle will be shown on both optical systems. A traveling grid will be provided in the wide angle system for establishing image motion compensation.

EITHER TYPE B-4 OR A-6 LAMBERT FLARE EJECTORS will be installed in external pods for night photography.

ALL ELECTRONIC EQUIPMENT will be installed in the equipment compartment.

EXTRA FUEL STORAGE is obtainable in the existing ammunition compartment.

A HIGH ALTITUDE SCANNER AND FLASH DETECTOR will be installed.

NACA / NASA USAGE AT AMES AND DRYDEN RESEARCH CENTERS

Family portrait of Ames test aircraft in September 1957. F4D-1 134759, F-102A 56-1358, F5D-1 139208 with yellow NACA tail band and TEST in black on the fuselage, F5D-1 142350 in its original Douglas paint scheme, and T-37 54-158. (NACA)

When the Navy cancelled the F5D-1 program, all four Skylancers were assigned to the then National Advisory Committee for Aeronautics (NACA) at Moffett Field, Calif. Both 139208 and 142350 were delivered on 20 August 1957. 139209 and 142349 remained on loan to Douglas until being delivered to NACA Moffett on 16 June and 18 June 1958 respectively.

139208 became NACA 212 and 142350 became NACA 213. When NACA changed its name to the National Aeronautics and Space Administration (NASA) on 1 October 1958, the F5D-1s became NASA 212 and NASA 213. At the time the Skylancers arrived at NACA, the Ames Moffett Field facility was assigned the '200' series block of numbers. At a later date Ames was assigned number series '700' and Dryden was assigned '800'. Both aircraft were transferred to Dryden in 1961. 139208 arrived on 16 January and 142350 arrived on 15 June. On 4 March 1963, 139208 was returned to Ames and later renumbered NASA 708. NASA 708 was retired on 9 April 1968. 142350 was renumbered NASA 802 and remained at Dryden until July 1970.

The two flying examples of the Skylancer were used initially at Ames to conduct high speed flight testing and as such sometimes encountered nearby Navy aircraft. Retired Navy Captain Dreesen recalls: "Sometimes if the NACA pilots finished a research flight with fuel left they'd drop into the tactical areas used by the Moffett and Alameda squadrons, where they would troll for F-8s and a round of head-butting. The Crusader pilots would think it was easy meat in the form of an F4D-1, but against the faster and more maneuverable F5D-1 the Crusaders often lost. Such unbriefed dogfighting was acceptable in the late 50s, unlike today."

In retrospect, Captain Dreesen observed that "it's sort of a shame the Navy didn't just abrogate the F4D-1 contract as soon as the engine problems were apparent and let Douglas develop the F5D-1 and take it instead --- it would have been a very good airplane."

In 1961, F5D-1s 139208 (NASA 212) and 142350 (NASA 213) were transferred to Edwards AFB for use as test aircraft in the Dyna-Soar project. In fact, though, only NASA 213 became involved in the program.

The Boeing X-20 Dyna-Soar was designed to be mounted atop a Martin Titan 3C rocket which would enable it to achieve earth-orbit. Once in orbit, the spaceplane would conduct its top-secret military mission and then re-enter earth's orbit to make a gliding 'deadstick' landing. Since the Skylancer had a wing planform similar to the projected Dyna-soar, it was used to develop abort procedures and to establish approach glide slopes for deadstick landings.

Neil Armstrong (famed astronaut) was at the time a NASA test pilot involved in the Dyna-Soar program. He used the F5D-1 to develop an escape procedure for the X-20. The procedure

Above, the number four F5D-1, 142350, became NACA 213. Seen here in May 1958 the aircraft retained its Douglas paint scheme while at NACA. NACA added the yellow wings and tail stripe with black NACA markings, as well as black AMES, TEST, and NACA 213 on the fuselage. (Larry Smalley via Harry Gann)

was a vertical climb to 7,000 feet, which was the estimated escape height an X-20 would reach after firing its small escape rocket. At 7,000 feet the stick was eased back and the aircraft would come out of the climb on its back, from where it would be rolled upright and enter a low lift-to-drag ratio approach to landing on a simulated 10,400 foot landing field meant to represent a runway at Cape Canaveral, Florida. To fully simulate the escape procedure, the Skylancer used a 200 foot entry altitude followed by a 500 mph pullup at 5Gs.

The Dyna-Soar (dynamic soaring) project was cancelled in December 1963, but NASA 213 remained on at Dryden (Edwards AFB) for use as a chase plane and approach test vehicle for other lifting body projects. 213 became NASA 802 in 1965 and was used until its retirement in 1970. Today, this Skylancer can be found at the Neil Armstrong Museum in Wapakoneta, Ohio.

NASA 212 was fitted with an Ogee wing in an effort to test the leading edge vortex phenomena. Leading edge vortices occur on wings with a sharp leading edge and are a result of a continuous separation of airflow along the edge. Unlike wing tip vortices, leading edge vortices extend spanwise from root to tip and serve to improve lift in a similar manner to leading edge flaps. They occur most successfully on Ogee wings where the leading edge sweep angle at the root is acute.

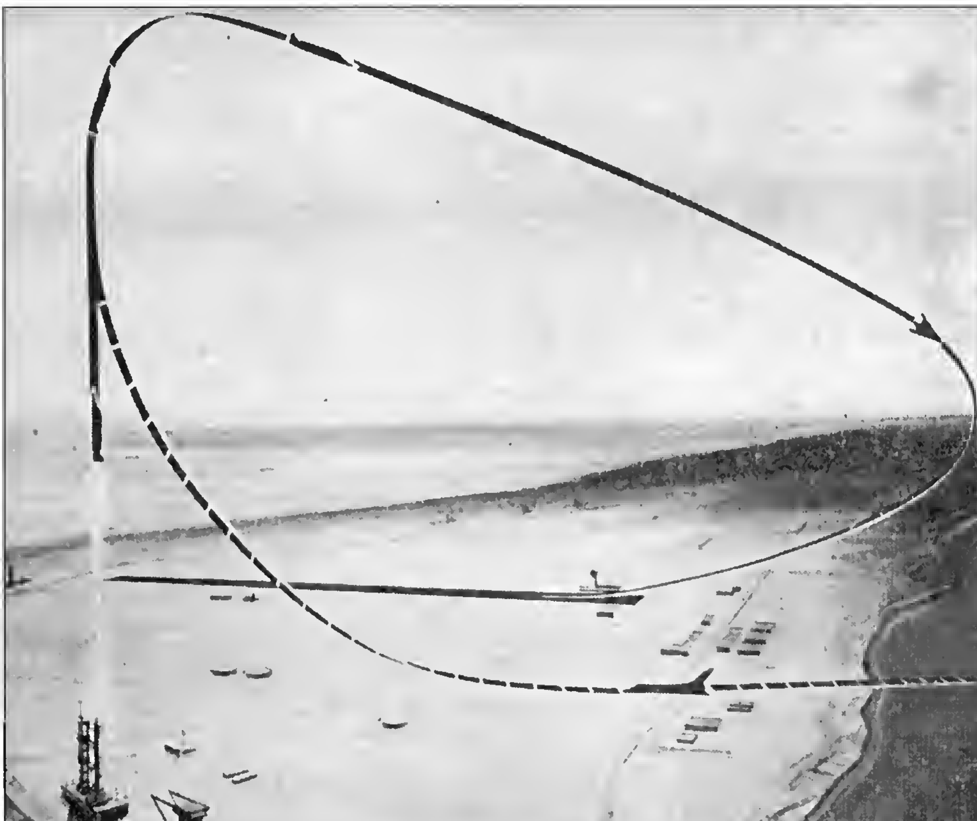
The wing was tested first in the Ames 40X80 foot wind tunnel to verify the design. The wing extension was created by adding wood and plywood stringers covered by thin aluminum. The Ogee wing remained on NASA 212 throughout the remainder of its career, with the aircraft eventually being redesignated NASA 708.

At Ames in 1963, NASA 212

Below, NASA 213 in revised color scheme in 1961. (Gene Sommerich via Harry Gann)

Above, NASA 213 at Edwards AFB (Dryden Research Center) in 1961 with Neil Armstrong at the controls preparing for a Dyna Soar test flight. Aircraft is white and da-glo red. (NASA)

Below, artist rendition of the F5D-1 Dyna Soar simulation. Solid lines shows where simulation duplicates real conditions.



along with an JF-100C Super Sabre and a A-5A Vigilante, were involved in SST tests. Since the Skylancer's modified delta wing was similar to the proposed wing of the SST, the F5D-1 was used on SST landing studies. Important data on approach characteristics and sink rates was obtained from the Skylancer.

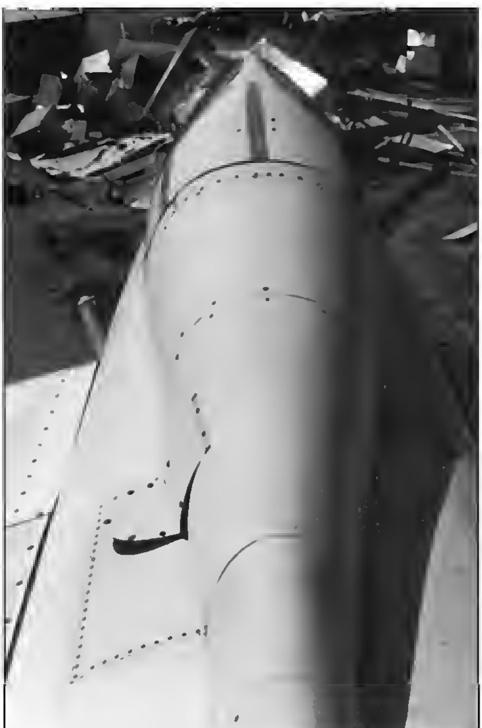
In January 1971, the Ogee-winged F5D-1 was turned over to Burton W. Wadsworth, president of the Victor Valley College, where it was used for many years as an instructional airframe.

Above, NASA 212 (139208) at Ames on 5-21-60 in modified white and Da-Glo red paint scheme. Note Ames on the tail and nose. (William Larkins)
Below, NASA 708 (ex NASA 212) at Ames Moffett on 10-28-66. In this side view, the Ogee wing is barely visible as a thin line extending to the intake lip. (Clay Jansson)

Above and at right, the Ogee wing on NASA 212 (139208). The color scheme is white and red with a black left wing covered by wing tufting. The anti-glare panel is grey aft and black forward. (NASA) Below, two views of NASA 708 in 1967. The right wing has been repainted black and has had tufting added. NASA 708 appears in white on the upper right wing. The bottom right wing is white with black NASA 708 on it. (Steve Brown)

NASA 708 RETIRES TO VICTOR VALLEY COLLEGE

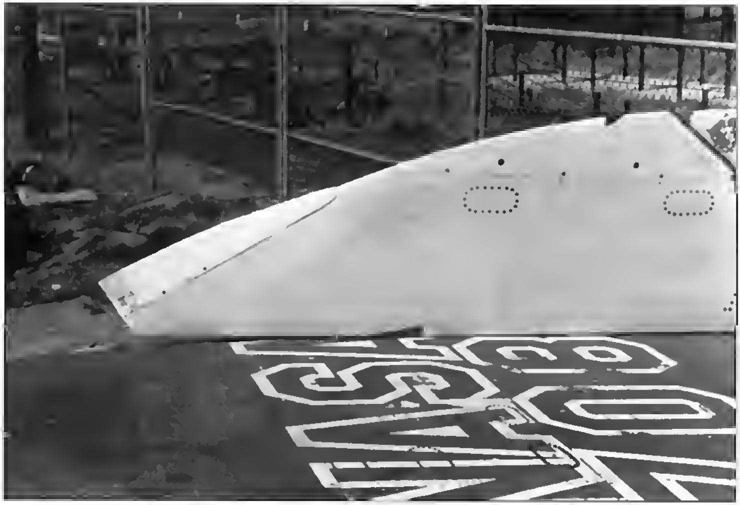
Above, 708 was demilitarized by cutting the vertical fin before delivery to the college. Below left, the spine of the F5D-1 as seen from above becomes very pronounced. Below right, the wooden plug used as a stringer or frame to extend the leading edge of the wing into the Ogee configuration. (Craig Kaston)

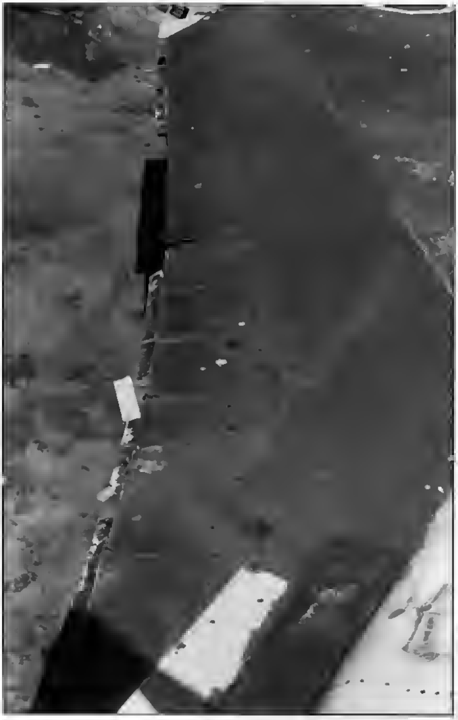


At right, upper right wing showing its black surface with white lettering and the da-glo red outer wing. The Ogee wing extension can be seen as a riveted metal extension.

Below left and right, the Ogee wing extension was really quite significant in area and was tapered to a very sharp edge. The wing was anything but smooth. It consisted of overlapping metal and exposed screws as well as metal stiffeners bolted to the outside of the wing and intakes.

(All photos Craig Kaston)






NASA 802

At left, NASA 802 (ex NASA 213) being utilized as a chase plane on an HL-10 lifting body drop test flight from the B-52 mother ship on 1 June 1966. (USAF via Craig Kaston)

At right, NASA 802 undergoing maintenance in the NASA hangar at Edwards AFB in October 1966. The boarding ladder is yellow and the three photo recognition squares are white and black. Note the belly engine bay access doors are open. (via Nick Williams)

Below, the F5D-1 was flown to Wright Patterson AFB in July 1970 by NASA test pilot Milt Thompson, who also flew some of the Dyna Soar profiles with Bill Dana and Neil Armstrong. The aircraft remained on outside static display in front of the museum building until completion of the Neil Armstrong Museum at Wapakoneta, Ohio. (Fred Dickey)

THE NEIL ARMSTRONG MUSEUM AT WAPAKONETA, OHIO

The Neil Armstrong Museum was opened on 20 July 1972, on the third anniversary of Armstrong's first step on the surface of the moon. The museum itself is constructed by a series of mound structures centered around a sixty foot diameter astro-theatre dome. The interior exhibits include Armstrong's Gemini VIII space suit and the Gemini VIII spacecraft in which Armstrong and David Scott orbited the earth in the first space docking mission in March 1966. Ohio's early flight achievements are also shown in the form of the Toledo Two airship built in 1905, a Model G Wright Brothers flying boat built in Dayton and flown by Ernest Hall in 1913, and a basket and equipment from Ohio's early balloon era.

F5D-1 NASA 802 is exhibited on a concrete pad at the entrance to the museum. On either side of the Skylancer is parking and two walkways which lead to the museum. When the two walkways become one, a string of runway lights marks the way to the exhibit building. The museum also has a lounge area.

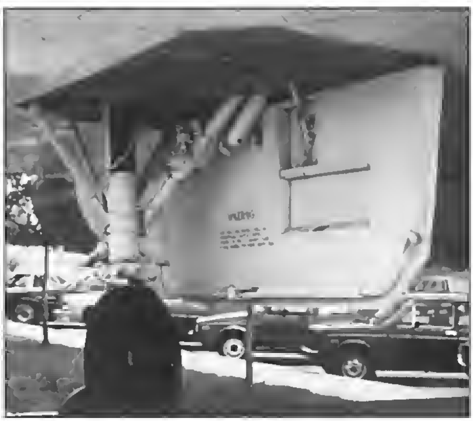
Below, two views of the all white F5D-1 at the Armstrong Museum. The tail stripe and rescue arrow are yellow. The aircraft never flew operationally in this scheme.

At right top, tailcone, tailhook, and tail bumper wheel detail.

At right middle, nose gear detail with nose gear strut completely deflated.

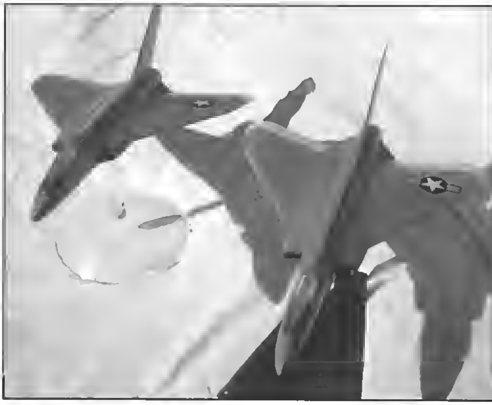
At right bottom left, main gear door arrangement. The main gear strut is completely compressed.

(All photos Wayne Morris)



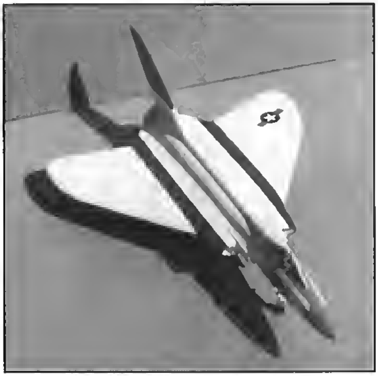
DOUGLAS F5D-1 SKYLANCER MODELS

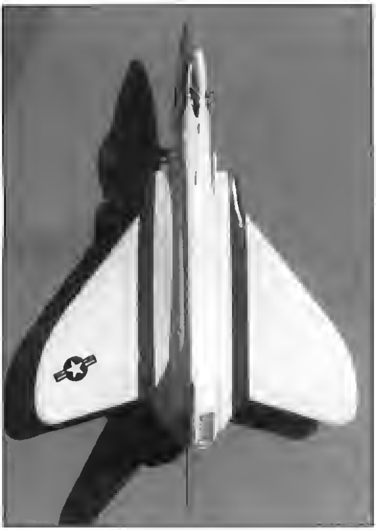
Above, large (about 5 ft) display model at the Museum of Flying. (Ginter) Below, two Douglas desk models. (Wayne Morris)

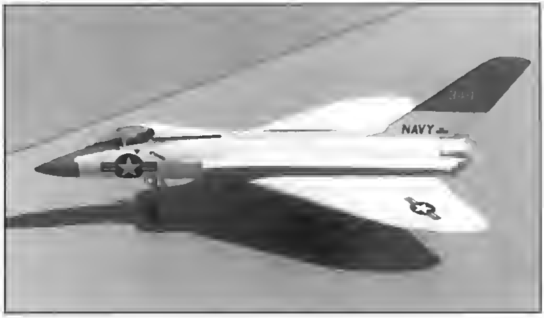


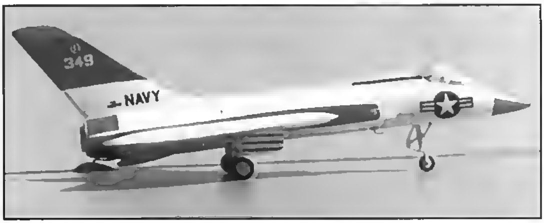
MAINTRACK 1/72 SCALE VACUFORM F5D-1 SKYLANCER KIT PX-033

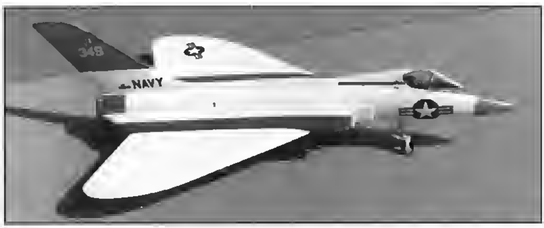
This 1995 kit is well constructed and consists of one white plastic vacuform sheet augmented by 26 white metal parts and a clear canopy. A very good decal sheet is included as well as a good set of color marking three view drawings for F5D-1 139208. However, the drawings identify the tail and wing markings as blue instead of red. Decals are also included for F5D-1 142349. Construction of the kit is straightforward and provides the modeler with a welcome addition to their collection of nifty-fifties Naval aircraft. Some of the white metal parts could be deleted by using F4D-1 or other parts from the spares box.

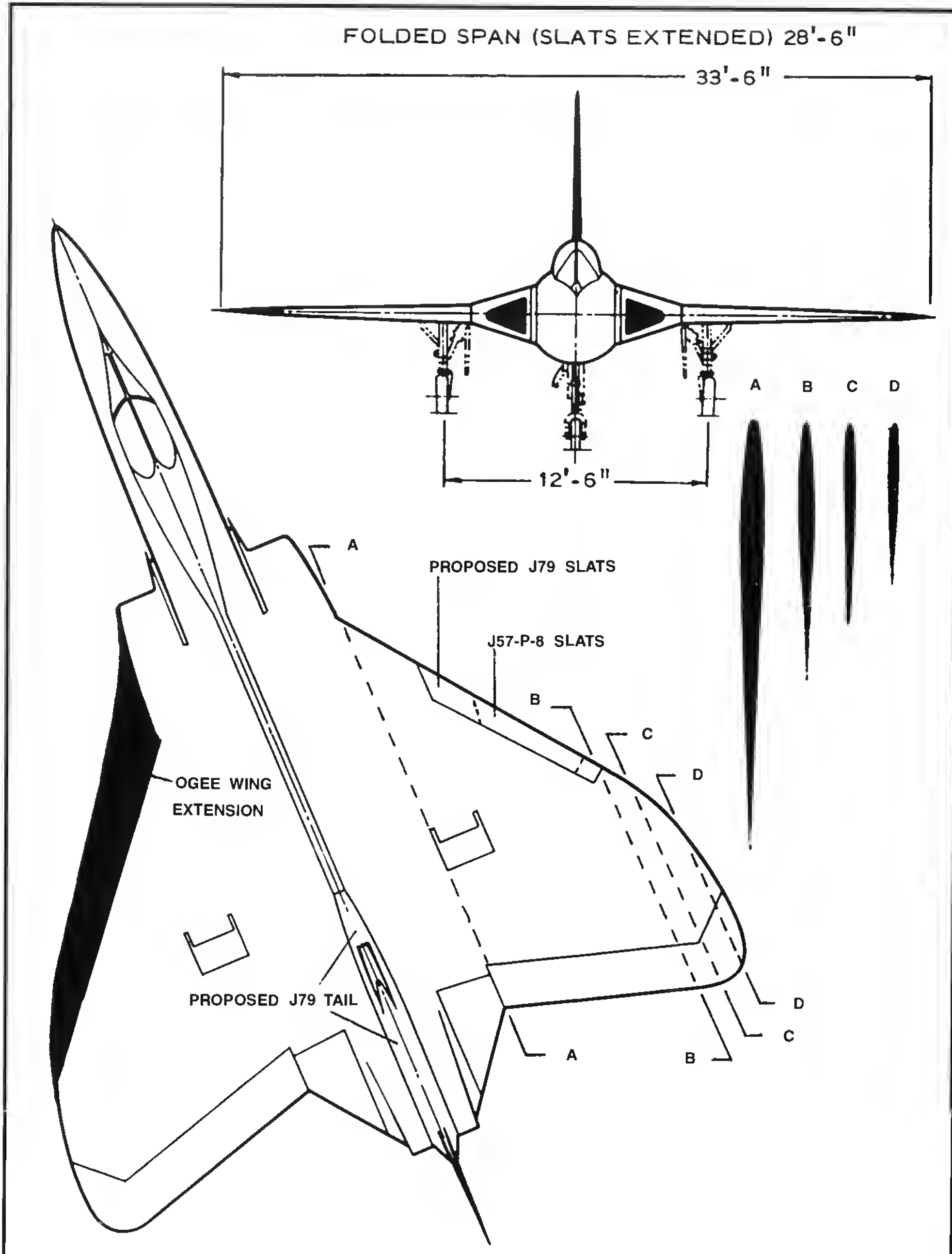


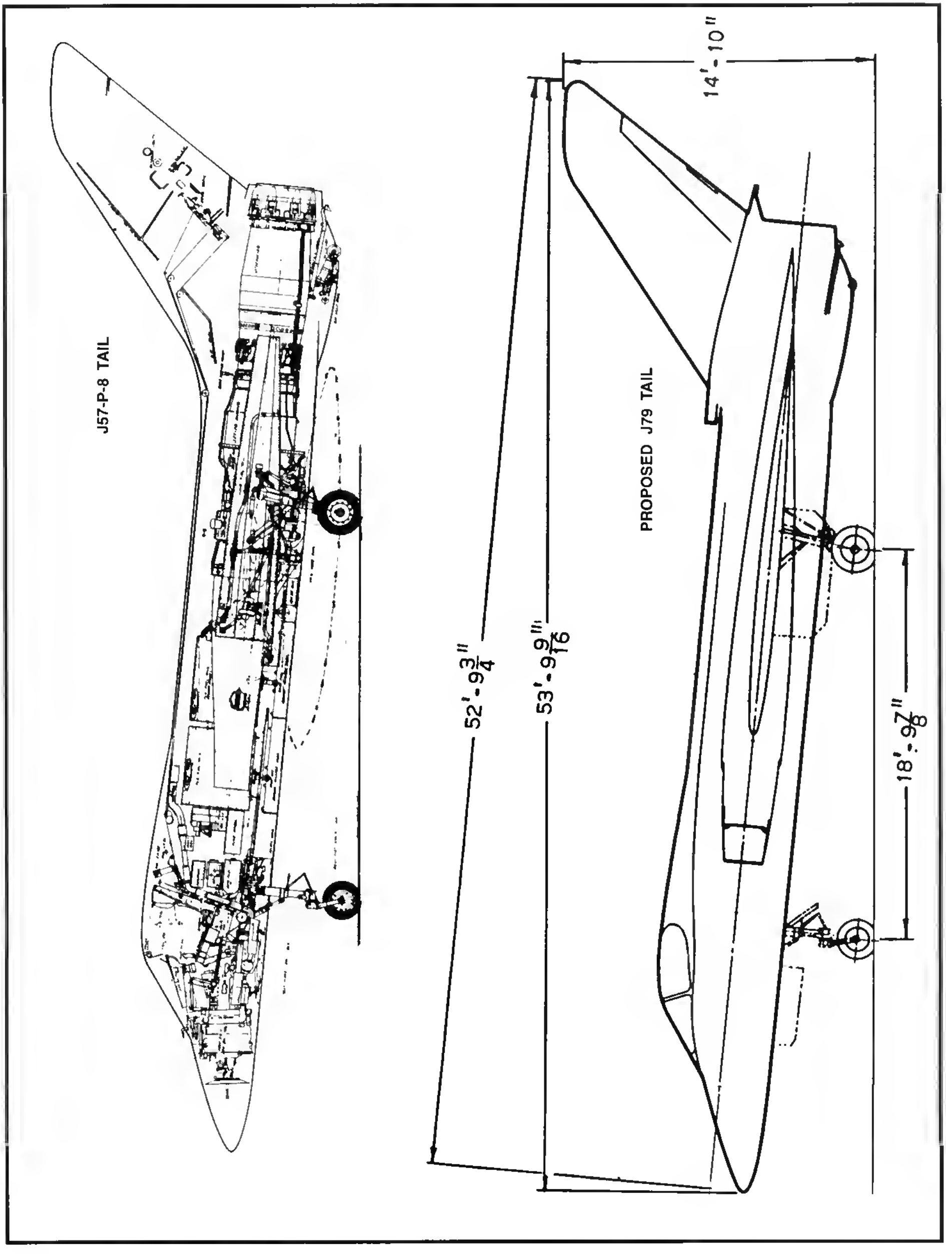


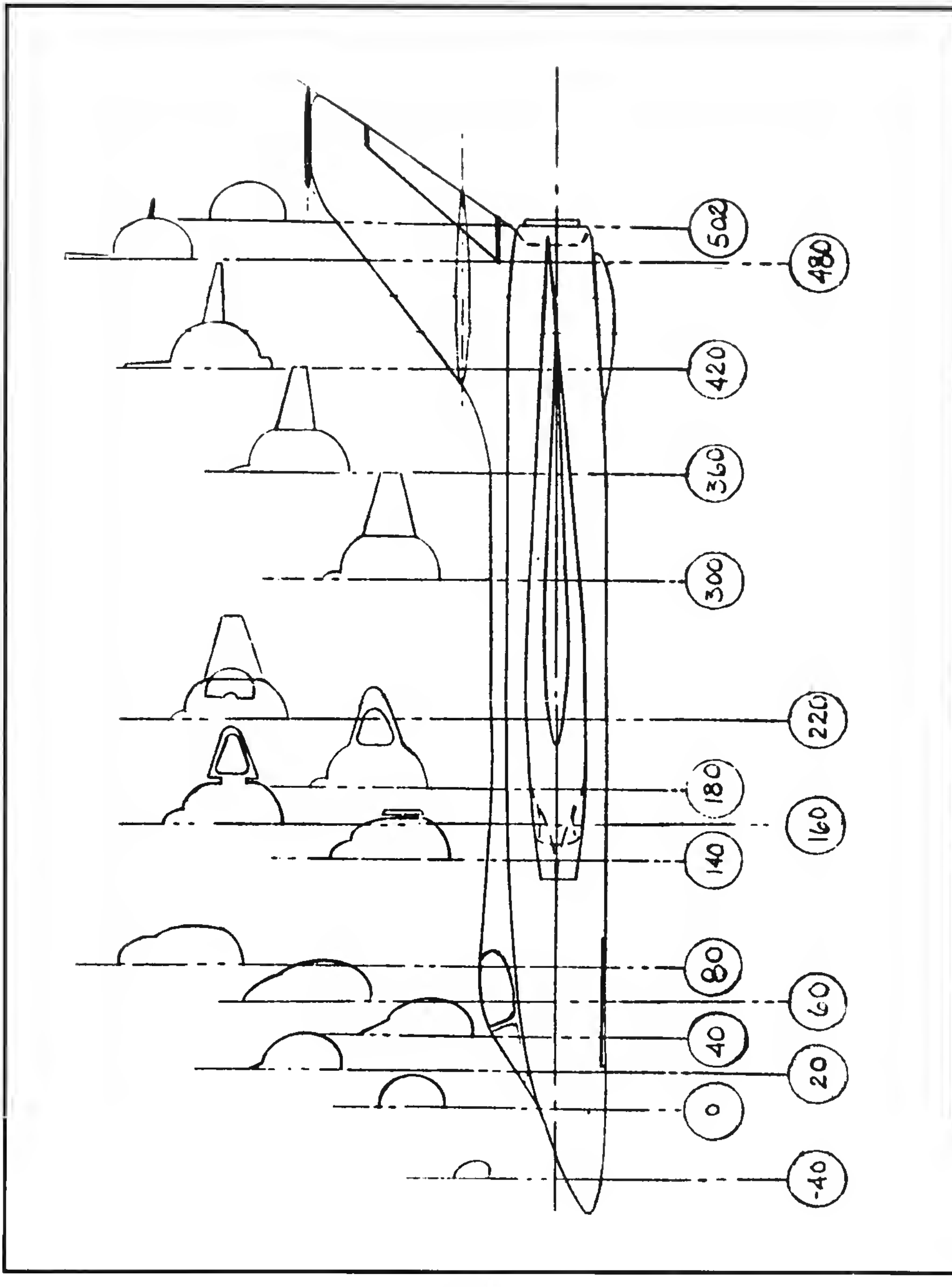







FOLDED SPAN (SLATS EXTENDED) 28'-6"
33'-6"
12'-6"
A
B
C
D
A
PROPOSED J79 SLATS
J57-P-8 SLATS
B
C
D
OGEE WING
EXTENSION
PROPOSED J79 TAIL
D
C
A
B


J57-P-8 TAIL
PROPOSED J79 TAIL
14'-10"
52'-9 3/4"
53'-9 9/16"
18'-9 7/8"


502
480
420
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300
220
180
160
140
80
60
40
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0
-40

The October 19, 1956 memorandum from SECNAV, W. H. Moore, to the Asst. Sec. of Defense (Engineering) concerning the Fighter Aircraft Readjustments in F.Y. 1957 Program, was followed up on November 6, 1956 by a multipoint summary on why, in the best interests of the Navy, the F5D-1 program should be eliminated. Included in the summary, and the basis of many of the points mentioned therein was the following chart:

SUMMARY OF FIGHTER PERFORMANCE

MODEL	F4D-1	F3H-2N	F8U-1	F5D-1	F5D-1 P-14 Engine	F5D-1 P-14 Engine	F4H-1	F8U-3
Armament								
Guns or Rockets	28/2.75"	4/20mm	32/2.75"	72/2"	72/2"	72/2"	0	0
Sparrows	0	0	0	2	2	2	4	3
External Tanks/gal.	2-300	0	0	0	0	2-150	0[1]	0
Gross Weight—Lbs.	25,116	32,424	26,875	28,855	28,530	30,882	39,839	37,500
Total Fuel (JP5)—Gal.	1,240	1,507	1,273	1,382	1,682	1,973	1,932	
Catapult T.O. Speed—Kn.	134	126	138	151	150	162	137	136
Avail. End Speed—C11	123	126	137	136	135	132	139	142
Limited By	Strength	Strength	Strength	Strength	Strength	Strength	Capacity	Capacity
Wind Req'd—Std. Day	+11	0	+1	+15	+14	+30	-2	-6
G.P. Radius								
Combat at 35,000 Ft.	325	400	380	—	290	420	325	430
Combat at 40,000 Ft.	370		440		365	495	435[3]	530
Ave. Cruise Alt.	40,200	37,000	42,000	40,500	39,000		40,000	40,600
Mission Time								
Combat at 35,000 Ft.	1.6	2.0	1.9		1.4	1.9	1.6	2.0
Combat at 40,000 Ft.	1.8		2.1		1.7	2.2	2.1[4]	2.5
Combat Weight—Lbs.	20,652	28,324	23,413	25,095	24,770		34,475	32,244
Fuel—Gal.	640	905	764	829	829		1,182	1,160
Vmax—35,000 Ft.—Kn.	561	561	880	686	836		1,150	1,150
Vmax—35,000 Ft.—Mach	.96	.96	1.53	1.19	1.45		2.0	2.0
Vmax—45,000—Kn.	548	543	685	566	631		1,110	1,097
Vmax—45,000—Mach	.95	.95	1.19	.99	1.10		1.93	1.91
Combat Ceiling	52,200	48,700	51,500	49,400	51,300		53,400	50,700
Landing Weight—Lbs.	18,360	24,224	19,950	21,320	20,995	21,307[5]	29,109	26,988
Fuel—20% T/O—Lbs.	1,690	2,050	1,734	1,863	1,863		2,680	2,630
Vstall—Power Off	107	95.2	115.5	115.3	114.1	115	108	111.5
Vstall—Approach Power	101.7	91.2	111.9	109.4	108.1	109	102	109.5
Approach Speed	132	130	145	142	140.5	142	133	142
Wind Required (110 Kn Limit Ve)	+22	+20	+35	+32	+31	+32	+23	+32
Approx. Ult. Sinking Speed Strength	19.7	20.5	19.8	19.6	19.6	19.6	20.4	24.0

1 Notes (3) and (4) reflect the F4H-1 with 2-370 gal. or a single 600 gal. tank.

2. At +85°F the F5D-1 with P-14 engine and tanks requires 186 kns for Cat T.O. Speed, 132 for C11 speed, and +50 for Wind Required on a standard day.

3. Radius with tanks in Note (1) is 735 and 690.

4. Time with tanks in Note (1) is 3.2 and 3.0 hours.

5. Landing weight with empty drop tanks.

6. Approach speeds taken as 1.3 Vs1 with power except for F3H. 130 Kn. from NATC.

7. Combat wt. for F4D taken as full internal.

8. All T.O. speeds based on military thrust, no afterburner.

9. F5D T.O. speed determined by a/g = .05.

10. Radius problem combat with afterburner at speed midway between Vmax — Mil. and Vmax — Combat.

11. 110 Kn. limit on arresting gear is average between 105 Kn. for CVA-41 class and 115 Kn for CVA- . Limit is temporary (Will be 135 Kts — However F5D takes extra strength).

12. F4D retains tanks until empty in radius problem. If dropped at start of combat, radius decreases to 160 n.mi. and 110 n.mi. for 35,000 Ft. and 40,000 Ft. Combat.

BACK COVER: Top, F5D-1 142350 shortly after its arrival at NACA Ames. The original Douglas paint scheme was altered by adding the yellow NACA wings and tail stripe and the word TEST to the fuselage and NACA 213 to the tail. (W.T. Larkins) Middle, NASA 802 (142350) flying chase for a HL-10 lifting body test on 1 June 1968 (USAF via Kaston) Bottom, side view of NASA 802. (USAF)


TEST
NACA 213


NASA 802


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802